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DEPARTMENT OF THE INTERIOR
DOMINION OF CANADA

REPORT

OF THE

SUPERINTENDENT OF FORESTRY

PART IX., ANNUAL REPORT, 1907

OTTAWA
GOVERNMENT PRINTING BUREAU
1907

PART IX

FORESTRY

FORESTRY.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

DEPARTMENT OF THE INTERIOR,
OTTAWA, July 10, 1907.

W. W. CORY, Esq.,
Deputy Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the annual report on forestry and other matters under my control, accompanied by the reports of other officials in charge of special divisions. The reports presented for last year covered the work of last summer, both in fire ranging and tree planting, and consequently there is but little additional to report in regard to these services.

My appointment to the office of Superintendent of Forestry dated from March 1, last, on the resignation of Mr. E. Stewart, and, therefore, the report on forestry is mainly a review of Mr. Stewart's work. It seems a fitting occasion to sketch the development of the branch which he has initiated and organized. When Mr. Stewart assumed office in 1899, nothing had been done by the Dominion to organize a fire preventive service. To this work he first addressed himself, and developed it from year to year, till during the past season there were 52 fire rangers acting on Dominion territory, and the testimonies to the efficiency and value of the service are numerous and widespread. The co-operative tree planting scheme was begun in 1901, and since that time 8,471,092 trees have been distributed to 3,328 settlers. During the first year the distribution was 50,280, and for the present year will be 1,925,185 trees. Forest reserves aggregating an area of 3,450,720 acres have been set apart and established by statutory authority, and a timber survey has been completed on two of the reserves and is being continued on others, with the purpose of laying out scientific plans of management. This short *résumé* shows that Mr. Stewart has, in a few years, established a work of far-reaching importance to the future of the Dominion in which he may feel a just pride.

It is also regretted that Mr. Roland D. Craig, Inspector of Forest Reserves, and Mr. H. C. Wallin have resigned from the service to accept more remunerative positions elsewhere. Both were well equipped technical officers and their removal means a serious loss to the service. It emphasizes the necessity for making the government service sufficiently attractive to qualified men to insure permanency in the staff and a sustained development in policy and administration.

The office work and correspondence have largely increased as a result of the growth of the business of the branch, and it will be necessary to provide an adequate clerical staff to keep it in proper order.

The timber survey of the Riding Mountain reserve was continued during the past year, and it is hoped that the larger part of it will be completed this season, making possible the formulation of working plans for cutting the timber so as to remove only the annual product, and provide for the renewal of the forest.

By order in council of December 29, 1906, copy of which is attached, regulations were established for the cutting of timber in the Riding Mountain, Duck Mountain and Porcupine Hills reserves. These regulations, in accordance with the object for which the reserves are set apart, provide for the cutting of timber by settlers for their own use, the further restriction being made that those obtaining permits must reside within fifty miles of the reserve. The object of this latter provision is to confine the privilege of cutting timber to those who can make beneficial use of it, and to prevent, as far as possible, the obtaining of permits for purely commercial purposes. The dues provided for under these regulations are so adjusted as to encourage the removal of the dead timber and the less valuable species, and to preserve the most valuable. General regulations for all the forest reserves are now being considered.

During the past year an inspection was made of most of the forest reserves to ascertain the settlers located on them, and it is proposed to make an effort to induce them to remove therefrom so that the reserves may be kept intact and their administration made more feasible.

For the proper administration of the reserves it will be necessary to enlarge the staff and perfect the organization. Temporary fire rangers in the summer and unskilled assistance in the winter must give place to a permanent staff of qualified forest rangers if the purposes for which the reserves are established are to be properly carried out. The reserves have suffered severely from fire and must be guarded carefully. With such protection and technically qualified officers to make timber surveys and lay out working plans, the organization will be complete.

TIMBER.

The administration of the timber lands outside of the forest reserves, and of the grazing lands formerly conducted directly by myself has been placed under charge of Mr. B. L. York, under my superintendency, and his report thereon will be found under No. 23 of Part I, Dominion Lands.

The number of timber berths granted during the past year was 49, totalling an area of 410·6 square miles, and the amount received on account of bonuses was $226,360.45, being an average of $511 per square mile. It is satisfactory to note that recent sales of timber are yielding much larger average prices than have been received at any previous time.

The present method of disposing of timber is, however, not a satisfactory one. The department has, as a rule, little or no knowledge of the timber of which it disposes, and as the quantity now in private hands is fully adequate to meet present needs, no detrimental result would follow the holding of timber lands until government inspectors can examine and estimate the timber, so that an adequate upset price may be fixed before any berth is put up to competition.

The recent rapid development of the lumber business has largely increased the work of the timber administration, and to cope adequately with the situation will necessitate considerable strengthening of the staff generally, especially in the outside service.

The necessity for fuller knowledge of the timbered districts is emphasized continually by the experience of the department, and it would be a proper policy for the department to obtain directly more adequate information in this respect. The inquiry made by a committee of the Senate during the past session showed that the natural resources of the northern districts of the west are greater than the public had any idea of, but the evidence would be much increased in value if direct means were taken by the government to obtain information in regard to these districts, and, as a result, the administration of the timber therein could be more intelligently carried out.

The most important change in the timber regulations made during the past year was the provision for granting not more than one square mile of timber to the owners of small mills without competition at the rate of $100 for each permit in addition to regular dues. The object of this provision was to furnish a supply of lumber to settlers in districts where it could not be obtained conveniently. It is intended to cover special circumstances where timber is specially and locally required. This provision appears to be working out satisfactorily and to be serving the object for which it was established.

GRAZING.

The grazing regulations, established in 1905, have been sufficiently long in operation to show that they are working satisfactorily and, as the numerous applications which accumulated while the regulations were suspended have now been dealt with, it is confidently expected that no serious difficulty will be found in the further administration of the grazing lands.

IRRIGATION.

The construction of irrigation works in Southern Alberta and Saskatchewan continues steadily. The portions of the provinces referred to have been used in the past mainly for ranching purposes, operations being conducted on a large scale. With the influx of population and the necessity of feeding cattle during the winter, which was particularly emphasized during the past season, ranches are being reduced in size, and the irrigation of a few acres makes possible smaller holdings with an increase in the number of stock that can be carried. Irrigation will be found an important adjunct to the stock industry. At Raymond, in the province of Alberta, the beet sugar industry has been successful, with the assistance of irrigation. Many more profitable crops may be grown, and in regard to this, experiment is desirable.

An adequate and properly equipped agricultural experiment station could obtain a great deal of useful information in regard to the possibilities of irrigation, and the government would be fully justified in giving such a station generous support. The duty of water for different soils and crops, the crops that can be grown most profitably, the length of the irrigation season and methods of applying water, the prevention of loss by seepage and evaporation, and many other questions of great importance could be worked out experimentally at such a station.

There are some large projects under construction or operation at the present time, namely, those of the Alberta Railway and Irrigation Company, the Canadian Pacific Railway Company and the Robins Irrigation Company. By the construction of large and expensive works these projects will make available for irrigation purposes sources of water supply which could not be developed by the individual with small resources.

Irrigation will be a large and important factor in the development of this part of the west, and the staff of the irrigation office and the means at their disposal should be made sufficient to adequately investigate the water supply and the methods of its utilization and to deal with the large interests that are involved.

During the past season special attention has been given to the gauging of the streams and the inspection of projects under construction, as will be seen by the report of the Commissioner of Irrigation.

Respectfully submitted.

R. H. CAMPBELL.

APPENDIX No. 1.

CANADIAN IRRIGATION SURVEYS.

REPORT OF JOHN STEWART, D.L.S., C.E., COMMISSIONER AND CHIEF ENGINEER OF IRRIGATION.

Department of the Interior,
Calgary, Alberta, April 5, 1907.

In the spring of 1906, I sent three engineering parties into the field, one in charge of Mr. J. F. Hamilton, C.E., to gauge all large rivers and streams and establish gauge rods. During the season Mr. Hamilton gauged some 56 streams all told, and established 12 gauge rods in the large streams as follows: Bow river above the C.P.R. headgates. Fish creek at the L. E. railway crossing. Sheep river at railway crossing. Highwood river at traffic bridge. Willow creek at the railway crossing. Oldman river, below the railway crossing. Pincher creek at Pincher. Watertown river, section 20, township 5, range 27, west 4th meridian. Belly river, section 13, township 3, range 28, west 4th meridian. Watertown river at lakes, section 8, township 2, range 29, west 4th meridian. St. Mary's river above Alberta Railway and Irrigation Company's headgates. On all the above gaugings a careful cross-section was made.

The second party was in charge of Mr. P. M. Sauder, with instructions to inspect and report on all the various irrigation schemes which had been authorized and not completed in Southern Alberta, also to gauge all the small streams and make any surveys required by parties purchasing land under the Irrigation Act. Under those instructions Mr. Sauder made 85 inspections and reported on same to this office, and five surveys of land in connection with applications to purchase under the Irrigation Act, and gauged 34 streams.

The third party was in charge of Mr. R. J. Burley, with instructions to inspect and report on all the irrigation schemes authorized and not completed in Saskatchewan, also to gauge all small streams and make any surveys that would be required of lands sold under the Irrigation Act. Under those instructions Mr. Burley inspected 121 irrigation schemes and reported to this office. He also made 23 surveys of lands in connection with applications to purchase under the Irrigation Act, and took gaugings of 17 small streams until the current meter he had went out of order.

During the summer of 1906 I inspected the homestead and irrigation scheme of A. B. & E. Ward, at Kamloops, B.C., also a dry lake for W. W. Nichols, on section 23, township 26, range 2, west of the 2nd meridian, near Yorkton, and in December I inspected a portion of the irrigation scheme of F. P. Aylwin, as far as Arrowood creek, but owing to depth of snow I had to abandon the survey, which I had completed in February last by Mr. J. F. Hamilton, C.E.

During the past season I inspected the works of the Alberta Railway and Irrigation Company, twice, with reference to their expenditure on enlargement and extensions of their works.

With reference to the inside work of this office, since July 1, 1906, there have been 984 communications received, and 2,163 sent out, as well as 43 applications for water rights (in duplicate), 263 agreements for the supply and use of water (in quadruplicate), and some 136 gauge rod readings. There have also been some 20 right of way plans examined and compared, and recorded.

For the coming season it is intended to carry out practically the same programme of work in the field as last year and have three parties employed on the same class of work and covering the same territory.

JOHN STEWART,
Commissioner and Chief Engineer of Irrigation.

APPENDIX No. 2.

REPORT OF NORMAN M. ROSS, ASSISTANT SUPERINTENDENT OF FORESTRY.

DEPARTMENT OF THE INTERIOR,
OTTAWA, April 3, 1907.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa, Ont.

SIR,—I have the honour to submit my seventh annual report, dating from June 26, 1906.

With the exception of about two months, from December 23, 1906, to March 2, 1907, which time was spent in the office at Ottawa, I have remained at Indian Head conducting the nursery and general tree planting works in the west.

From June until the ground froze up in November, weather conditions were very favourable for tree growth and general nursery work. There was but little rain during the fall, and all new growth had an opportunity to become well matured before winter set in. A heavy fall of snow occurred early in November, which formed a good protection over all the smaller stock and in the new plantations. Throughout the winter the snow fall has been very heavy, and although the weather has been exceptionally severe very little, if any, damage from winter killing is apparent at the present date. Considerable damage has, however, been done by rabbits. This is general throughout the west, judging from reports received from widely separated points. Some men report that their cottonwoods and ash have been very badly cut back and girdled, but the elm is the worst sufferer. In the nursery the cottonwood and ash have not been touched, but the elm is completely cut down, European larch very badly damaged, and the top shoots and terminal buds of Scotch pine nipped off wherever they projected from the snow. The native larch, with the exception of one or two trees, has escaped entirely. Some shrubs, especially *spirea van houttei* and *spirea arguta,* were cut clean to the snow line; *rosa rugosa* bushes were badly nipped and of several fine cut-leaf birch only the stumps remain. As far as the broad leaf varieties are concerned the results are not likely to be serious, but the young conifers will, I am afraid, be very badly misshapen, owing to the loss of the main shoots, and will take some time to recover a good growth. The native white spruce was not touched and the young stock in the transplanting beds was well protected by deep drifts of snow so that it has not suffered.

It is possible, owing to the great amount of snow, that some damage may result from snow break in the various plantations throughout the country, but up to the present we have not had any reports to that effect.

In my last report I have given the names of the inspectors employed during the summer and the districts in which they worked. The reports received from them are as usual very favourable. In Southern Alberta about as far north as Olds, on the

Edmonton-Calgary line, some injury was done to maples and cottonwoods by winter killing in 1905. This is due no doubt to the effect of the chinook winds which are prevalent in that district, but might also have been caused by cultivation being carried on too late in the fall, thus inducing a late growth which could not mature before the heavy fall frosts. No cultivation should be given among trees after about the middle of August, unless it may be necessary to hoe out a few weeds, which should, under no condition, be allowed to go to seed.

There are to be distributed this spring about 2,000,000 seedlings and cuttings. The varieties as usual will be mostly maple and ash, with a smaller percentage of cottonwood and willow. The percentage of ash will be greatly increased in the plantations for Alberta, the number of maples being reduced as much as possible. The ash in this district has proved exceptionally hardy and is likely to be more satisfactory than maple in the long run.

The number of those receiving trees this year is considerably in excess of last year. I have not at present got the lists from Ottawa, and cannot give the exact figures. The numbers of applications being received both at Ottawa and at the nursery here indicate a very great increase in the interest taken by the settlers generally, and show that this branch of our work is becoming extremely popular. In this case, too, I am unable to give exact figures owing to the fact that these lists are compiled at Ottawa, and have not yet been completed.

PLANTING ON SPRUCE WOODS RESERVE.

As stated in my last report, 17,000 two-year-old Scotch pine seedlings were added to the plantation on Spruce Woods reserve. It is the intention during the coming season to continue this planting, as results obtained up to the present are very encouraging. It is hoped next season and in the future to use considerable numbers of jackpine and native spruce seedlings in this work. Up to the present we have not had facilities for raising these varieties in any quantity, and have also experienced considerable difficulty in securing good seed, especially of the spruce. We find that for the last two years the cones have been infested by a small white caterpillar which destroys numbers of the seeds; consequently a great quantity of cones have to be collected in order to get a very little good seed.

EXHIBITS.

An exhibit was made at the Winnipeg and Brandon fairs in July and August. This exhibit did not differ in any essential respect from those previously prepared for these fairs, and the nature of these exhibits has been fully described in former reports.

NURSERY WORK.

As stated in my last report we had at Indian Head, during the summer of 1906, 36½ acres under nursery crops. The stock on 20½ acres of this was large enough for digging and heeling in for distribution this spring. The following quantities of seedlings were obtained from this area:—

Maple, 1 year old	586,000
Ash, 2 years old	1,022,000
Elm, 2 years old	15,000
Total	1,623,000

This is approximately 200,000 less than we raised in the previous season, this being due to the almost total failure of a four-acre plot of maple seedlings which should have produced in the neighbourhood of 350,000 plants. This plot is well sheltered on all sides but the east. Unfortunately, in the spring, just after the seedlings appeared above ground, we had for several days extremely strong and constant east winds. These driving winds kept the surface soil constantly moving, so that in a very short time the tender leaves of the seedlings were completely cut to pieces. As our stock of maple seed was exhausted it was impossible to reseed this plot. Losses of this nature must, however, be expected. Owing to the sudden changes in temperature in early spring great damage may sometimes be done by late frosts, but the chief danger is to be feared from the frequent and extremely strong winds which always seem prevalent at this time of the year.

Arrangements were made to import from North Dakota 300,000 cottonwood seedlings which were to have been delivered in November. However, only half this number could be procured for fall delivery; the remainder are to be shipped this spring. This will bring the total number of seedlings for distribution up to 1,923,000. About 2,000,000 are required, and willow cuttings will be prepared to make up the necessary total. On well prepared ground we find that there is no difficulty in getting 80 to 95 per cent of willow cuttings to strike, and as the growth is very rapid they are well suited for setting out, in permanent plantations, with the other seedlings distributed.

This spring we give up the use of 17 acres which had so kindly been put at our disposal by the Director of Experimental Farms, for nursery purposes, since 1901. During the coming summer we cannot hope to produce more than about two and a half million seedlings for distribution in 1908, as we have not yet had time to thoroughly put into condition an area more than sufficient for this number. An additional 25 acres will be fit for sowing this fall, so that we shall then have about 75 acres in good condition for nursery purposes. This should permit us to grow on an average three and a half millions annually for distribution. Owing to the difficulty of obtaining labour at certain seasons of the year, and especially the very short time during which digging can be done, it would seem at present that this number will be practically the limit of broad-leaf seedlings that we can expect to produce annually from this nursery.

COLLECTION OF SEED.

Owing to some heavy late frosts in the spring of 1906 the blossoms on maple and ash were so injured that the seed crop of these varieties was a total failure throughout Manitoba and Saskatchewan. Luckily we had on hand a large supply of ash seed picked in the fall of 1905, which was sufficient for our sowing in the fall. Maple seed, however, could be procured only in North Dakota, and it was only possible to obtain 900 pounds from this source. As this will not be much more than sufficient for our own purposes, it will be possible to distribute only a few pounds. During past seasons large quantities of maple and ash seed have been sent out to those applying for it, and from reports received, many farmers have provided themselves with a good stock of young plants grown from this seed.

Elm seed was collected in the Qu'Appelle valley, in June, as stated in last report, a sufficient quantity to sow about 3 acres.

Several bushels of white spruce cones were picked in the Spruce Woods reserve near Sewell, but, as before stated, these cones were so badly infested by a small caterpillar that proportionately only a very small amount of good seed was extracted.

Jackpine cones (*divaricata*) were collected in the Riding mountains by the forest survey party, and forwarded to the nursery, where the seed was extracted during the winter.

Through the kindness of the Japanese Bureau of Forestry, at Tokio, we have been able to obtain a small collection of Japanese trees and shrubs for trial purposes. Other conifer seeds are expected shortly to arrive from Europe. I regret very much that we have again been unable to collect any seed of the native larch.

CONIFERS.

The results of our nursery work with conifers during the past five years are extremely encouraging. We have now at the nursery, plants ranging from one to five years of age, all grown from seed. The great majority of these are native white spruce, Scotch pine, and native jackpine. Several other varieties being grown on a smaller scale give promise of good results. Among these might be mentioned Colorado spruce (*picea pungens*) western white pine (*pinus flexilis*), Norway spruce (*picea excelsa var. septentrionalis*), the seed of which is obtained in Finland, and *pinus cembra* or Swiss stone pine. All the younger stock has come through the winter exceptionally well, owing to the very heavy covering of snow. Some of the older plants which were not so well covered were damaged by rabbits, but with the exception of some Scotch pine which were, last spring, imported from France, there is no sign of winter killing. These French pines have in some cases been very badly browned by the sun and cold winds, though the buds seem still to be in a healthy state and I do not fear that many will be lost, though at first sight large numbers appear to be dead.

The native larch has again during the past season made a most splendid growth. The European variety, though apparently perfectly hardy, suffers so badly from rabbits that some means of protecting plantations of this variety would have to be devised in order to obtain any good results. It is doubtful whether ordinary wire netting would be of much use, as unless the fence were very high the snow would, early in the winter, drift up so much that the rabbits could easily get over it. To put up a very high fence would mean such an expense that one would not wish to do this except where the plantation was desired for testing or experimental purposes. Such trees as have escaped the rabbits show even a stronger growth than the native variety. We hope this spring to obtain from Europe a supply of seed of the Siberian larch, which is expected to be rather better adapted to the climate of the west than the common European variety.

PERMANENT PLANTATIONS.

All plantations set out since spring, 1904, have made splendid progress. White spruce set in 1904, last season made very strong growth, the new shoots in some instances being at least two feet long. In my last report a description of several new plantations set out in 1906 was given. The five acres of coniferous planting (white spruce and Scotch pine) appear up to present date most successful. Of the broadleaf plantations set out last spring, the elm in No. 4 (a mixture of elm and ash) has suffered very badly from rabbits. The native white birch in plantation No. 3 (a mixture of Manitoba maple and birch) did not transplant well, nearly 50 per cent dying. This was due no doubt to their poorly developed root system on account of their having been too close together in the seed bed. A very interesting point is shown in this plantation, the value of transplanted and seedling stock. In this plot approximately 1,315 birch seedlings and 500 birch transplants were used. Of the 500 transplants not a single one died and all made very strong growth. Of the seedlings, handled and planted with equal care and on exactly same ground, about 60 per cent succumbed. As we have no ground which can be spared for further permanent planting this spring, we cannot continue along this line at present.

It is hoped, however, that about 25 acres of new land will be prepared for this special purpose and be fit for planting in 1908.

ORNAMENTAL GROUNDS AND SHRUBBERY.

Each season adds to the appearance of the lawns, drives and shrubbery planting. The main drive, which is about 500 yards in length, has been thickly planted on either side with various kinds of hardy, ornamental shrubs set in irregular groups with an occasional tree here and there. The belt of shrubs extends on either side of the drive to a depth of from 18 to 50 feet and is bounded by a few rows of trees for shelter purposes. The principal varieties of shrubs are lilacs, Tartarian honeysuckle, Ginnalian maple, *rosa rugosa,* red twigged dogwood and some varieties of spireas. With the exception of the Ginnalian maples, these are all flowering shrubs. The different varieties have been planted in masses or groups in order that during the blooming season the best effects may be obtained. In the neighbourhood of the buildings and around the lawns herbaceous perennials and annuals are used extensively in the borders. The number of visitors to the nursery is increasing very rapidly, and no pains should be spared within reasonable limits to make this portion of the grounds as attractive as possible, if only to demonstrate to new comers in the west what may be expected in this country as a result of proper methods of cultivation and the selection of suitable varieties.

PLOUGHING AND FARM WORK.

In addition to the work entailed in looking after the general nursery crops, there were raised on the nursery over 2,000 bushels of oats, 200 bushels of barley, and about 20 tons of rye grass hay. A considerable quantity of the oats has been disposed of for seed grain, as the whole crop is not required for our own feed. During the winter the horses are fed only on oat straw with a small quantity of grain, and considerable straw is required for bedding throughout the year. This is one of the reasons for growing more oats than we actually require for our own use; another, and the principal one, is that in order to fit the ground for nursery purposes it is a great advantage to raise a grain crop on the land after it is freshly broken. During the season of 1906, 20 acres of ground were ploughed as summerfallow and 30 acres broken, backset and thoroughly disced and harrowed. In the fall 10 acres of the summerfallow was sown to ash seed marked off into one-acre plots, and caragana seed sown to provide permanent hedges to shelter the plots and mark their boundaries.

BUILDINGS.

Owing to the increase of the work and the lack of accommodation for the required number of labourers, it was found necessary to erect another house for this purpose on the nursery. Work was commenced on the building in October, which was completed during the winter, and is now being occupied by the men. We now have comfortable accommodation for about 18 men. Though not more than eight or nine are regularly employed during summer, the extra work in the spring and fall necessitates the employment of many temporary hands, whom in the past we have found it very difficult to obtain when accommodation could not be provided for them.

Owing to the addition to the nursery of an adjoining 160 acres, an extra team of horses had to be purchased, which made necessary a small addition to the present stable. This is now under construction and will be completed before the spring work commences.

When our work was first started in 1902 a small building used as a packing house was built on the experimental farm. This building will have to be moved up to 'the nursery' during the coming summer, and should be considerably enlarged, as it is now far too small for our present distribution work.

ADDITION TO NURSERY.

The quarter-section adjoining the original 160 acres on the west side was added during the past season to the nursery. This land is still prairie; it is comparatively rough, is rather lighter in soil than most land in the district, and in places there are good natural bluffs of aspen, with a general strong growth of wolf willow over the greater portion. This scrub will require cutting out before breaking can be done, but the general character of the soil is very suitable for tree growth. The ground is far too rough to be of value for nursery crops, so it is intended to use it altogether for setting out comparatively large demonstration plantations and raising our grain and hay crops. It is proposed to break up and backset 50 acres this summer, 25 of this to be ploughed a third time, and if possible put in shape for planting in the spring of 1908. An attempt will be made to collect this spring about 30,000 native larch seedlings, which will be transplanted in the nursery and set out permanently in about a ten-acre plantation on this new ground in 1908. Large plantations of white spruce and native jackpine will be set out at the earliest opportunity, and considerable planting of rapid growing broad-leaf varieties, such as willow and cottonwood, will be done, with a special view to demonstrating the practicability of raising fuel quickly. Results from plantations of this nature should prove of great value to the west generally, as at present it is not possible to obtain any reliable data regarding the growth of trees under cultivation for economic purposes. This we find to be a great handicap when trying to persuade some men to plant for direct returns, as, without actual facts and figures, it is difficult to convince a person, who has had but little experience with trees in this country, that such work would be very profitable.

MACHINE FOR SOWING MAPLE AND ASH SEED.

Since 1901 all our seed has been sown by hand, and as each year the number of acres to be sown has increased different methods for doing this work have necessarily been evolved. When only a small area was required drills were made with a Warren hoe and the seed scattered in the drill, which was finally leveled over with a rake. This necessitates a line being stretched for each drill, and was an extremely slow process. Such a method with three or four acres to sow within a few days becomes out of the question. A plough was then tried for making the drills. This somewhat hastened the operation, but a large gang was required to keep up with the team and cover over the seed before the ground dried out or the seed was blown out of the furrows. The plough was discarded, as this buried the seed too deeply.

Finally we adopted a method of marking out drills with an ordinary single horse scuffler, only the two back teeth being used with large shoes, the teeth being spread apart to about 30 inches. The seed was dropped as evenly as possible and another single horse strawberry cultivator was used for covering in the seed. By thoroughly flailing the seed in bags during winter and rubbing it through sieves of about ⅜ of an inch mesh all the wings were taken off, and it was found that a man could drop the seed very fast and very evenly in calm weather. We find that with this method four men (two driving the scufflers and two dropping seed) were able to sow as much as four acres a day, making the drills 20 to 30 inches apart. On windy days, however, it was impossible to make any headway there. Where strong winds are so prevalent, there are often weeks at a time when it would be out of the question to sow in this manner. When twenty or thirty acres have to be sown before a certain date in the spring, sowing by hand entails too much risk. There seemed to be no reason why, after the seed had been well cleaned and separated from the stalks a machine could not be found which could do the work even in windy weather. A machine has been obtained from the Massey Harris Co., which after considerable difficulty has been so arranged that from all appearances and from tests made in the shop, it should do very satisfactory work. This seeder will sow three drills at a time 30 inches apart, and is worked on the same principle as the grain drill. The seed can be put at any depth, and attachments are provided for covering in the drills. It is to be hoped that the seeder will turn out to be satisfactory when put to the actual test, as with it 8 to 10 acres per day should be sown, using only one man and two horses. There should also be a great advantage in having the seed dropped more evenly and covered more uniformly. The possibility of regulating the furrows without difficulty is a point of great importance.

During the past winter there was great suffering caused, owing to the scarcity of coal and the practical impossibility of obtaining wood at any price in many districts. A similar state of things is likely to occur again at any time in the future. Such an experience should convince all far-seeing settlers as to the advantage of growing their own fuel. That this can be done, within a very few years and at a considerable financial profit in almost any part of the west, is undoubtedly a fact. As large areas can be planted and cared for at a proportionately less cost than very small plantations, it would seem that something should be done along this line, either by the rural municipalities or the government. In many parts of Europe there are communal or municipal forests. These are operated by the municipalities, usually under the direction of the state, and the resulting profits are used for ordinary municipal expenses. In many cases the revenues are so large that taxation is not necessary to keep up municipal work. It would seem a reasonable proposition, in this country, that in regions where natural wood supplies cannot be obtained except at great expense the municipalities, probably with the co-operation of the government, should obtain considerable areas and plant these up with such trees as would seem most profitable. The original cost of planting, &c., could be largely met by first growing on the land a crop of grain. If a section in each district could be obtained for this purpose, supposing 100 acres were planted each spring for six years, a portion of the remainder could be utilized for cropping and 100 acres summer-fallowed every summer to be ready for the next spring's planting, until the whole area was stocked. In from seven to ten years a certain amount of fuel could no doubt be obtained, the quantity and value increasing annually with the age of the plantation. Such a plantation would very soon become self-supporting from sales of wood and would undoubtedly return a substantial profit in later years. With municipal wood lots of this nature throughout the country little fear need be entertained as to a repetition of last winter's experiences. I make this suggestion in the hope that some method may be considered for at least testing the practicability of this proposition. The necessity for something of the sort is very evident, and the great advantages which would result to the country generally would seem to warrant the government in very materially assisting any municipality that would be willing to co-operate in this work; perhaps even, in order to encourage the work, it could establish these wood lots, and after they had become remunerative they might be turned over to the control of the municipalities.

Your obedient servant,
NORMAN M. ROSS,
Assistant Superintendent.

APPENDIX No. 3.

REPORT OF HUGO CLAUGHTON-WALLIN.

DEPARTMENT OF THE INTERIOR,
OTTAWA, March 31, 1907.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa.

SIR,—I have the honour to submit herewith my annual report of work carried on under directions from the Forestry Branch.

At the beginning of the fiscal year I was conducting a forest valuation survey in the Riding Mountain Forest reserve, with the assistance of seven students in forestry.

In the year 1905 similar work had been carried on in the Turtle Mountain and Moose Mountain reserves under the supervision of Mr. R. D. Craig. The method followed this year was the same as the previous season, and as described by Mr. Craig in his last report. A valuation survey was made of the following townships: townships 23, ranges 19, 20 and 21; townships 22, ranges 20 and 21; townships 21, ranges 20 and 21; townships 20, ranges 19, 20 and 21; townships 19, ranges 18, 19 and 20. The following townships were partly surveyed: township 22, range 19; township 21, range 19; township 20, range 18; and township 19, range 17.

Here as well as in the other Manitoba timber reserves fire has caused considerable damage. Of the townships mentioned above the best timber is found on townships 23, ranges 19 and 21; townships 22, ranges 19 and 21; and township 21, range 19. Some good timber is to be seen in township 23, range 20, and townships 20, ranges 18 and 19; but with this exception the ground gone over was found either almost entirely devoid of mature timber and generally covered with good five to twenty year old reproduction of aspen and balm, or very open and prairie like, with scattered smaller bluffs of green timber, as specially in the country south and west of Clear lake.

The coniferous trees found in the reserve are white and black spruce, larch, jackpine and some balsam.

The deciduous trees are represented by aspen, balm, birch, Manitoba maple, oak, ash and elm. The last four varieties are found chiefly on the north and east slopes of the mountain.

The prevailing forest consists of aspen and balm in a broken stand, with small groves of spruce and scattered birch. Large muskegs of larch and black spruce are numerous near the height of land. Jackpine is found northeast and southeast of Clear lake. Fire has, however, done much damage there. The reproduction is excellent in places.

The injuries done by insects to the timber are not very important. I quote the following extracts from the notes of Mr. Jas. R. Dickson, of the University of Michigan, who was the entomologist of the party:—

'The spruce is sometimes attacked by the destructive bark beetle (*dendroctinus rufipennis*). At the present time no considerable damage has been caused by this borer, but there is always a danger of it causing widespread injury. The spruce gall louse is abundant at Clearwater lake, where it gives the spruce a very ragged appearance, attacking and killing the lower branches first and thus making conditions most favourable for the rapid spread of a fire. The shield-bearing spruce borer is very commonly found in the fallen or dying timber. North of Clear lake the larva of a species of *retinia* was found attacking the young spruce cones, destroying the seeds. The jackpine has many insect parasites. Among them may be mentioned a *pissodes* larva which kills back the leaders in the young reproduction. On the bark is the pine louse (*chermes pinicorticus*) and the cones are sometimes ruined by the weevil *dryocaetis*.

'Probably the worst insect enemy of the aspen in the Riding mountains is the spotted cottonwood beetle (*lina lapponica*). The striped variety (*lina scripta*) was also captured. The dark, spiny larva of these beetles are defoliators, and when numerous soon skeletonize the leaves over a considerable area.

'The ants, birds and predaceous beetles are, however, holding the destructive insects well in check, and the entire insect damage is a mere bagatelle when compared to the losses by either fire or fungi.'

The trees in the Riding mountains that seem to suffer most from the fungi are aspen and balm. Stands of them are found where scarcely a tree is not affected by these pests, chiefly *polyporus igniarius*. Wherever we find any of these hoof-shaped brackets in a tree it is a sure sign that the fungus has gained access to the tree and is destroying the wood. Settlers should be directed to do their cutting in these affected stands, as the only method of checking the disease is to remove the affected trees.

The coniferous trees are in a healthier condition, though quite a few fungi-affected specimens are found on the reserve.

Game is quite plentiful. Moose and elk were often seen by members of the forest valuation party. There is no doubt, however, that their number is decreasing, as during the open season the mountain is a regular play ground for all kinds of hunters and would-be hunters, who, according to their own tales, are not very particular about sex or number of slaughtered animals; and there are many squatters who, during the closed season, would not let a possible chance of a shot at an elk pass. Tracks of bears were seen now and then. Beavers were found at work at Lake Audy and the Whirlpool river. The bird family is well represented.

The survey work for the summer was closed on the last day of September. In October I was occupied with the locating of squatters on the Riding Mountain reserve. I found about fifty families, mostly French half-breeds and Galicians. The former are scattered around Clear lake, where they have fair buildings but very little land under cultivation. The Galicians are principally in the western part of the mountain. It is a pity that these people have been allowed to settle on the reserve, as there is no doubt that they are and will be the cause of many a destructive fire. Every year there are some new families moving within the boundary of the reserve. A special report in regard to the squatters and their improvements has been made, to which I would refer you for further information.

At the end of October I returned to Ottawa. and have during the winter been occupied with working up the data secured during the summer. If it be my privilege to continue the work in the Riding Mountain reserve next summer I hope to be able in my next report to give a full account of the amount of timber, the rate of growth of the different species, the quantity of wood that could be cut yearly, &c. Volume tables will be constructed.

I have the honour to be, sir,
Your obedient servant,
HUGO CLAUGHTON-WALLIN.

APPENDIX No. 4.

REPORT OF A. H. D. ROSS, M.A., M.F., TECHNICAL ASSISTANT.

OTTAWA, ONT., April 1, 1907.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa.

SIR,—I have the honour to submit the following brief report of my work subsequent to September 14, 1906. From that date I continued my work of inspecting the tree plantations established by the co-operation of the Forestry Branch with settlers in Northern Manitoba, and along the Yorkton branch of the Canadian Pacific Railway in Saskatchewan as far as Foam lake.

In most instances I found the trees well cared for, and that the growth was excellent. In some quarters there is a prejudice against the green ash because of its slow growth at first and its liability to injury from rabbits, but most planters are now convinced that it is an excellent tree to mix with the faster growing Manitoba maple or boxelder, willow and cottonwood, which give the desired ground cover to prevent evaporation, and at the same time break the force of the severe gales which blow across the prairie for days at a time.

From October 4 to 25, I inspected plantations in the Maple Creek region in Saskatchewan, and the Medicine Hat, Gleichen and Calgary districts in Alberta. Here I found that the cottonwood, green ash and willow have done best, the Manitoba maple or boxelder being generally killed back by frosts following the warm chinook winds.

On October 26 I left Calgary for Ottawa, arriving here on the 31st. During the winter I have been engaged in the office preparing the lists of applicants to receive trees the coming season; drawing plans showing how the trees sent out should be mixed to get the best results; helping in answering of inquiries of various kinds; the drawing of curves showing the height and diameter of growth of spruce and larch in the Riding Mountain reserve, and other routine work.

Your obedient servant,
A. H. D. ROSS.

APPENDIX No. 5.

REPORT OF F. W. H. JACOMBE, M.A., M.F., TECHNICAL ASSISTANT.

OTTAWA, ONT., April 11, 1907.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa, Ont.

SIR,—I have the honour to present my report for the period extending from September 8, 1906, to March 31, 1907.

During the remainder of the month of September, 1906, I continued my work of inspecting the plantations along the Soo line. Most of these I found to be in good condition, in spite of the very dry weather during the summer, and well cared for. Cottonwoods planted in the spring of 1904 had, in a number of instances, attained a height of eight feet or thereabouts. The inspection of this line was finished by the end of September.

Since December 1 I have assisted in the office work of the branch at Ottawa, my work having consisted of drawing plans for new applicants planting trees this spring for the first time, making out distribution lists and performing other routine work in this connection.

I have the honour to be, sir,
Your obedient servant,
F. W. H. JACOMBE, *M.A., M.F.*

APPENDIX No. 6.

REPORT OF A. P. STEVENSON.

DEPARTMENT OF THE INTERIOR,
OTTAWA, ONT., April 1, 1907.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa, Ont.

SIR,—I have the honour to submit the following brief report on the work done by me as tree planting inspector in connection with the work carried on in this province by the Forestry Branch of the Department of the Interior.

Early in June, 1906, I went to Winnipeg to meet Mr. N. M. Ross, Assistant Superintendent of Forestry, to arrange inspection work in Manitoba for the summer. Two men were expected from the Yale Forest School, Mr. Ross and Mr. Jacombe, to take part in inspection work. On June 21 these men arrived in Morden, where I met them, and in a few days they began on the work of inspection.

Mr. Jacombe began work at St. Claud on the Glenboro branch of the Canadian Pacific Railway, working westward to Estevan, in Saskatchewan; Mr. Ross working along the main line of the Canadian Pacific Railway and its northern tributaries in Manitoba.

The district covered by myself was the Red River valley and westward to Boissevain, also the main line of the Canadian Northern Railway, from Winnipeg westward to Warman, Saskatchewan. This is a new district, both as regards settlement and applications for trees to the Forestry Branch. The majority of the settlers are from the United States, and all thoroughly appreciate the benefits of a properly planted and laid out shelter belt. This is evidenced by the fact that 99 per cent of applicants for trees are only two years settled on their land. With them trees are just as essential to life on the plains as are buildings, and as a result only expressions of satisfaction are heard with the broad-minded policy of the Forestry Branch in assisting them with advice and planting material. Of the trees set out in the spring of 1906, 95 per cent were alive in the fall. The spring was a favourable one for tree planting, and the young trees, on account of the careful supervision in packing and shipping, arrived at their destination in first-class condition.

It was noticed that the ash tree is giving splendid satisfaction, where grown with boxelder or elm. Planted four feet apart each way the growth is very satisfactory. The Russian willow and cottonwood are showing up very prominently, being among our most rapid growers. The latter are great favourites with the American settlers, who are delighted to find the well-known tree will succeed so well with them in this country. The groves planted out in 1901 and 1902 under the co-operative scheme are now in many cases fine plantations, and in some districts are changing greatly the appearance of the landscape, the dull monotony of the plain giving place to nice bluffs of trees. It is also noticed that the interest in fruit growing is increasing on account of the farmers having these windbreaks. A demand is also arising for ornamental trees and shrubs and perennial flowers, which without the shelter belts would never have been heard of. During the summer of 1906 on various occasions trees in plantations set out under Forestry Branch supervision were measured and a height of 18 feet 4 inches recorded. This gives a fine object lesson of what can be accomplished in tree planting on the prairie, when the proper conditions are given as to planting, care, cultivation and right varieties.

Your obedient servant,
A. P. STEVENSON.

APPENDIX No. 7.

REPORT OF JOHN CALDWELL.

VIRDEN, MANITOBA, April 1, 1907.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa, Ont.

SIR,—I beg to submit to you my report for the summer of 1906.

I began work June 18, and finished November 15. The territory given to me was the Kirkella line to Neudorf, the main Canadian Pacific Railway line from the Manitoba boundary to Regina, and the Arcola line back to Manitoba.

The great bulk of this territory is wide, open prairie, and farmers are taking an ever increasing interest in the planting of shelter belts and windbreaks. Probably 85 per cent of all trees planted to date are doing well, which I consider quite satisfactory. A few years of this work under good supervision will add greatly to the appearance of the country and to the comfort of the homes.

About 75 per cent of the plantations in my district are made up of maple, ash and cottonwood, the remaining 25 per cent of elm, willows and Russian poplars. The demand of course is for fast growers. The elm and ash are a little slow, but still they are perfectly hardy and in the end will make by far the best and most durable trees, and in order to give the plantations a more permanent character we must insist on a fair proportion of these hardwood trees.

Very few willows or poplar have been sent out for four years, and while I am not in favour of many poplar I would like some. I have fifteen years' experience with willows in Manitoba and they are growing much in favour with me. They are extremely hardy and fast growers, they leaf early and hold the foliage late, and are likely to live a fair age.

The cost of growing willow cuttings in large quantities is about 75 cents per 1,000, although I would rather send them out rooted. The cost then would be about the same as cottonwoods from Dakota. A farmer, when once started with willows, could easily propagate from his own trees. I class the willows among our most useful trees.

Farmers are nearly always glad to see the government tree man come around, and they greatly appreciate the good advice tendered. No doubt, this past unusually severe winter, with a coal shortage, has caused many a farmer to wish he had a twelve or fifteen year old bluff back of his buildings. It would certainly have given him less cause for anxiety.

The question of whether trees can be grown on these western prairies is a question no longer, as we have splendid examples all over the country. Probably the most important feature with the inspector is to give the farmer to understand the importance of having the land in a good state of cultivation before he plants, and the necessity of good, clean cultivation afterwards. I am not in favour of handling trees too large. A first-class one-year-old maple is better than a first-class two-year-old; the expense of handling and shipping is less, the work for the farmer is less, which means a good deal in a busy time, and the younger tree is likely to take a hold more quickly and to make the best tree.

The best distances I still think 4 feet x 4 feet, or 3 feet x 5 feet, and we should always be careful and prevent breaks being planted too close to the buildings, as that is a mistake so often made. I find a good many farmers wanting more than they can properly look after; it is far better to take less and get more again. North of Moose mountain and along the Kirkella line there are large settlements of foreigners who know very little of the tree planting work. These people are mostly very industrious and progressive and producing a great deal of wealth. They are there to stay, and means should be adopted to let them know. They are generally fond of tree planting, and would more than likely take good care of trees given to them in this way.

Large farmers who are extensively into wheat growing are not so interested in tree growing as they should be; they are too busy making money. Among the farmers on the quarter and half-sections is where we are most appreciated and where we can do most good.

The planting of trees for fuel and fencing purposes has not received much attention as yet, but for shade and shelter nearly every man who intends living in the country is only too glad to avail himself of the opportunity of getting trees and advice in this way.

The Canadian Northern Railway and Grand Trunk Pacific expected to run from Brandon to Regina, will open up a large tract of new country, and for some years to come I expect a heavy demand for trees from southeastern Saskatchewan. I had the pleasure of visiting the Forest Nursery at Indian Head twice this summer and was gratified to see the wonderful improvement and the large quantities of good stock growing, under the charge of Mr. Ross. The growing of large blocks of healthy young trees is of great importance in connection with this work.

I find the general public very much in favour of this tree planting among the farmers. They know that in agriculture lies our sure foundation, and work of this kind, which adds so much value to the farms and gives the whole country so much more of a prosperous and comfortable appearance, is time and money very well spent.

With the country filling up so rapidly we are sure of a heavily increased demand. We know how dreary and desolate a new country looks, and one of the first desires expressed is for shade and shelter, and for years to come we should feel it our duty and pleasure to fully meet this demand with every possible encouragement.

Your obedient servant,

JOHN CALDWELL.

APPENDIX No. 8.

REPORT OF JAMES LEAMY, CROWN TIMBER AGENT.

NEW WESTMINSTER, B.C., May 20, 1907.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa, Ont.

SIR,—I beg to acknowledge the receipt of yours of March 27, last, asking me to forward as soon as possible my annual report in regard to the fire ranging service in the Dominion Railway Belt in British Columbia.

In compliance therewith I beg to submit the following short report:—

I have very little to add to my report of September 17, 1906, except to state that all the fires mentioned in that report were completely put down and very little damage resulted, if any, therefrom. The accounts in connection with last year's fire ranging system have been duly sent forward to your department. This season, about the latter part of April, the country being very dry, numerous fires have occurred, doing considerable damage, and I am informed that a quantity of saw-logs on skidways were burned on a limit owned by the Bowman Lumber Company on the east bank of the Columbia river, below Revelstoke. The matter was promptly attended to by Fire Ranger McRae. The last report from him is to the effect that fires are still burning, but are held in check. As the rain began here yesterday I have no doubt that the condition along the Columbia river will be bettered.

In this lower district several fires have occurred along the settled lands, but only in one instance have they extended into the timber, that is near Pitt lake, but we have had a very heavy rain within the last day or so, and those fires are extinguished.

I would respectfully suggest that I be allowed to employ more fire rangers, in order to prevent the occurrence of fires. During the last winter a severe sleet and snow storm occurred which broke down all the young timber, alder, &c., and has covered the ground in a great many places with a very heavy mat of this timber, and if fires occurred it would certainly prove very disastrous, and we cannot exercise too much vigilance in looking after them.

There has been some slight change made in the Fire Act in British Columbia, particularly regarding the locomotive engines and logging engines, which, if carried into effect will prevent a number of fires. I have a complaint to make against the Great Northern Railway Company. Their locomotives, owing to defective fire screens, have thrown sparks and caused numerous fires; in fact they are a menace to any country they pass through.

I may add that men are very scarce and are asking from $3 to $3.50 per day for their work. There is a great scarcity of labour in the country.

The rangers working so far are: Mr. Cameron Fisher, of Golden; Mr. Frank Ashdown, of Golden. I have divided that district in two, as it was much too large for one man to look after, and both will have their headquarters in Golden, but working in opposite directions. Mr. Alex. McRae, of Revelstoke; Mr. J. D. McGuire, of Salmon Arm; Mr. Angus McGillivray, of Ashcroft; Mr. Murdock Martyn, of New Westminster; Mr. F. W. Hughes, of Mission City; Mr. M. G. Fadden, of Upper Sumas; Mr. John Ball, of Abbotsford, and Mr. Neil W. Johnson, of Elgin.

Your obedient servant,
JAMES LEAMY,
Crown Timber Agent.

APPENDIX No. 9.

REPORT OF C. A. WALKINSHAW, FOREST RANGER.

BOISSEVAIN, MANITOBA, March 31, 1907.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa, Ont.

SIR,—I beg to submit to you my report of the work done in the Turtle Mountain timber reserve during the past year.

During the month of April and part of May the weather was very dry. Mr. Hamilton, my assistant, and I were kept very busy fighting fires. They were so numerous along the international boundary that I found it necessary to call out assistance to prevent them coming across into the reserve. One did come across at the western part of the reserve, between ranges twenty and twenty-two. While we were fighting this fire, I saw another near the boundary in range twenty, and going in the direction of the forest ranger's house and stable. I took assistance, and by the time we got there it was across the boundary, but fortunately the wind changed around and blew it back into Dakota. That night I counted fifteen big fires burning along the boundary. They made a good fire guard for us. I drove across the line and remonstrated with the settlers about their carelessness in setting out fire, but they only laughed at me. If the wind had not changed when it did the fire would have made terrible havoc in the reserve. When all danger from fire was past I planted two hundred young Scotch pine, sent me from the Experimental Farm at Indian Head, to see how they would do in Turtle mountain. Nearly 90 per cent of them grew and looked healthy when the snow came last fall. Mr. Hamilton and I made a good road through the reserve from the northern part of section thirty-three, township one, range twenty, to section nine, township one, range twenty, where the forest ranger's house is situated. When we got this road finished we patrolled the reserve, guarding against fire, and I am happy to say there was not a spark in the reserve all fall. I may say there was very little wood cut in the reserve this winter, as no person was allowed to cut green wood, and the snow being so deep, it was hard work getting dry stuff. A great many farmers who in other years hauled their wood from the reserve, bought coal or bought their wood from private parties who have wood lots in township two.

I am, sir,
Your obedient servant,
C. A. WALKINSHAW,
Forest Ranger.

APPENDIX No. 10.

REPORT OF JOHN RUTHERFORD, FOREST RANGER.

CARLYLE, SASKATCHEWAN, April 18, 1907.

R. H. CAMPBELL, Esq.,
Superintendent of Forestry,
Ottawa, Ont.

SIR,—I have the honour to forward you the following report of affairs in the Moose Mountain timber reserve.

The growth of young timber has increased greatly of late years. Practically speaking there is no standing dry timber, owing to severe wind storms. There is a considerable amount of lying half-green timber. I would strongly recommend the opening of a road through the centre of the timber reserve, running from Fish lake to the western boundary of the reserve.

I am, sir,
Your obedient servant,
JOHN RUTHERFORD,
Forest Ranger.

APPENDIX No. 11.

REPORT BY E. STEWART, SUPERINTENDENT OF FORESTRY, OF A TRIP DOWN THE MACKENZIE AND UP THE YUKON RIVERS IN THE YEAR 1906.

OTTAWA, November 16, 1907.

The Honourable FRANK OLIVER,
Minister of the Interior,
Ottawa.

SIR,—I have the honour to submit the following report on a visit made by me under your instructions during the past season to a portion of our far northern regions within the area drained by the Mackenzie and Yukon rivers. The route taken was down the Athabaska, Slave and Mackenzie rivers, crossing on the way Athabaska and Great Slave lakes, to the delta of the Mackenzie; thence across the mountains to the Bell and Porcupine rivers; down these streams to the junction of the latter with the

Yukon; and returning up the Yukon to Whitehorse, passing Dawson on the way; from Whitehorse to Skagway by rail, and thence to Vancouver by steamer.

The primary object of the trip was to gain information regarding the timber resources of that part of the Dominion, but note was also taken of the character of the soil and of the minerals, fish and game of the country.

PREFACE.

Having decided on the route to be taken, I communicated with Mr. C. C. Chipman, Commissioner of the Hudson's Bay Company, to whom I had been indebted for great assistance in a former journey to the Peace river, and received from him letters of introduction to certain officers of the company, which served as a passport that only had to be presented to insure not only ordinary attention, but all the hospitality that could be afforded in the country.

Mr. Thomas Anderson, Chief Inspector for the Northern or Mackenzie River district, accompanied the transports all the way down to Fort McPherson, and did everything possible to assist me. I am also indebted to the Royal Northwest Mounted Police for their hospitality in a country where hospitality means so much.

FROM EDMONTON TO ATHABASKA LANDING, 96 MILES.

After making what arrangements seemed necessary for the journey, I left Edmonton on June 3, 1906, for Athabaska Landing.

For the first twenty-five miles the road passes through a splendid agricultural country, which is well settled to the crossing of the Sturgeon river. After that the soil becomes lighter, and from there on to 'The Landing' it varies from what might be called second-class land to light sand covered with jackpine. This is along the trail, but I am informed that many tracts of good land exist at different points both to the east and west of the trail. This seems reasonable to expect, as the trail follows the ridges, which are more likely to be sandy than the lower lying land. Much of this second-class land is well adapted for grazing, there being a good growth of grasses and pea vine. On this portion of the route there is very little timber of special value, though the jackpine will be useful for railway ties, posts, &c.

We reached Athabaska Landing at noon on the 5th, taking about two days and a half to make the trip.

The weather was warm and at times sultry, culminating in a heavy shower of rain on the second day out. This was much needed for the grain, and also to quench the forest fires, which were becoming numerous.

FROM ATHABASKA LANDING TO GRAND RAPIDS, 165 MILES.

At 'The Landing,' which is on a southerly bend of the Athabaska, we learned that the steamer on which we were to take passage would not leave for a few days.

On the afternoon of Friday, June 8, our steamer *The Midnight Sun,* towing several scows all laden with supplies for the northern posts, let loose from the shore, and, assisted by the swift current so characteristic of those northern rivers, was soon hurrying down stream at the rate of ten or twelve miles per hour.

I shall copy pretty freely from notes taken on my trip, and the table of distances herewith copied from one in the Hudson's Bay Company's post at 'The Landing' will assist the reader in following the narration. I am informed that these distances are practically correct, as Mr. Wm. Ogilvie, D.L.S., made a micrometer survey of the route some years ago.

From Athabaska Landing to	Distance in Miles.
Pelican Rapids	120
Grand Rapids	165
Fort McMurray	252
Chippewyan	437
Smith's Landing	539
Fort Smith	555
Fort Resolution	749
Hay River	819
Fort Providence	917
Fort Simpson	1,078
Fort Wrigley	1,214
Fort Norman	1,398
Fort Good Hope	1,572
Peel's River (Fort McPherson)	1,854

The Midnight Sun is a flat-bottomed craft 120 feet long by 20 feet beam, and draws, when loaded, about 2 feet 6 inches. Her cargo, as well as that of the scows, contained almost every article that could be found in a departmental store—flour, bacon, tea, sugar, canned goods, powder, shot, guns, cartridges, blankets, clothing, kettles, axes—in fact everything that goes to make life even endurable in those isolated regions.

On board were several passengers; half-breeds going to different points; a party of four young white men, on their way to Fort McMurray, to resume work started last year in boring for oil there; a lady worker at the Anglican Mission at Hay river; a young clergyman of the same church on his way to Fort Norman at the junction of the Great Bear and Mackenzie rivers; a Mr. Steffensson, going to Fort McPherson and thence north to the Arctic sea to join the Anglo-American Polar Expedition; and a mounted policeman also bound for Fort McPherson, to join a detachment of the force there.

We passed the mouth of Lac La Biche river, which is about 40 miles down from 'The Landing,' and tied up for the night at the mouth of Calling river, at 7 p.m., having made 50 miles on our journey.

The country along the banks from 'The Landing' down for some 40 miles has suffered very much from fires. Below this point less damage has been done to the timber, which consists of poplar, birch, spruce, balm, &c., the spruce being mostly along the river and its tributary streams. It is generally rather too small for lumber, though some belts contain trees of a sufficient size for that purpose.

The appearance from the steamer would indicate that generally the timber is of second growth. The spruce seems to be overtaking the poplar and will supplant it in time. This timber is well worth preserving from fire. The country is undulating, not generally rocky, and the soil of a fair quality. Mr. Prudens says he raises as good wheat at Calling river as can be produced anywhere on the prairie.

The Athabaska is here about 60 rods wide, the current at this time about 3½ miles per hour, and the water of a yellow colour. The land rises gradually back from the river to a height of from 200 to 400 feet.

On Saturday, June 9, we started from Calling river at 8 a.m., and at 4 p.m. tied up at the upper end of Pelican rapids, having now made 120 miles from our starting point.

Near the water's edge on the north side of the Athabaska and at the upper end of Pelican rapids the Dominion government sunk a well two or three years ago. At a depth of some 837 feet, the last 87 feet being through tar sands, gas was struck, which prevented further sinking. From this well a strong current of gas and water issues. The gas was on fire at the time of our visit. The flame was about 15 feet high above the pipe, and the noise could be heard for perhaps a half mile distant. When first struck it could be heard several miles, and the flame was much larger.

The Dominion government, in prospecting for oil a few years ago, also put down a hole at Victoria, Alberta, hoping to strike oil on reaching the tar sands at an estimated depth of 2,100 feet. At 1,840 feet the casing became wedged and the work was stopped. Another attempt was made at Athabaska landing, with a similar result, the casing becoming wedged at 1,770 feet, within 30 feet of the calculated depth of the tar sands, where oil probably exists in considerable quantities. These tar sands will be referred to later on.

The timber is still poplar and birch, with some belts of spruce of rather small size. Very little exposure of rock along the banks has so far been seen.

At 1.15 p.m., on Monday, June 11, the steamer left the upper end of the rapids and ran down stream for three-quarters of an hour, when our pilot ordered another stop, as the wind was strong after us and he feared an accident in the rapids. Four of the scows that we had been towing were, however, sent on ahead.

At 5 a.m. on Tuesday, June 12, we started again, but in less than an hour had to tie up to repair the steamer. A stone had been stove through the planking at the bottom. We started again at 9.30 a.m., and reached House River rapid at 12.45 p.m., and tied up again. The water is too low at present for our boat.

The country is fairly well wooded in this part with poplar, birch and some spruce, but so far no great quantity of the latter of good quality has been seen. The soil is generally a clay loam, with sand on some of the hills, but on the whole I am fully persuaded it will yet be settled and found productive.

On Saturday, June 16, after four weary days of waiting, the steamer moved down the river about 6 miles to a point about 4 miles above Grand rapids. During this time she had been nearly emptied of her cargo by the scows, and this permitted her to pass through the shallow water. The fact is, this part of the Athabaska is scarcely navigable for steamers, except for a very short time in summer, when the mountain water is in flood.

Another delay of five long days, each one nearly twenty-four hours in length, occurred during which the steamer lay tied up to the bank above Grand rapids.

The days are not only long, but the weather is getting hot, 90 degrees in the shade being quite frequent, and the mosquitos are plentiful and quite as industrious as those in more southern latitudes.

These delays enabled me to see something of the country a little back from the river. I found it to vary considerably at different places. In some districts the soil was too light for agriculture, while in other parts there were stretches, of apparently considerable extent, of very fair land.

Regarding the timber a similar diversity exists. On the light, poor soil is generally found the jack or banksian pine, while on the heavier land the spruce and poplar are seen, provided in both cases the ubiquitous forest fire has not swept the country.

Our 'tie up' above Grand rapids was rendered more than sad by the death of a young Englishman on board named Herbert Bray. He was engaged as cook before leaving Athabaska landing, but a couple of days after starting he took seriously ill, and at 9.30 p.m., on June 20, expired. It was impossible to obtain any medical assistance, and any of the remedies obtainable seemed to do little good. He got worse and worse, suffering very much from vomiting till the end came. What was the trouble, or whether his life could have been saved under other circumstances, it is impossible to say. Perhaps it was a case of appendicitis, which does not always yield to medical treatment even in expert hands. We buried his remains the following day on the right bank of the river. I carved his name and date of death on a poplar tree nearby, and Mr. Steffansson made a lobstick of a spruce tree farther up the bank.

On Thursday, June 21, at 8.30 p.m., we left *The Midnight Sun* without regret, going in scows down the river to an island immediately at the head of the rapids. A tramway across this island for a distance of about a quarter of a mile is used for transporting the goods to a point below the roughest part of the rapids, where they are again loaded into scows and taken in this way to Fort McMurray, 87 miles down stream, over a portion of the river that is altogether too rough for a steamer of any kind. It was nearly midnight when we got our tents up on the bank beside an eddy below the rapids. I would estimate the descent of the river in these rapids to be about 50 feet. The banks here rise in terraces on each side of the river to a height of perhaps 300 or 400 feet. The country in the neighbourhood of these rapids has been burned over, and the land is rather too light for agricultural purposes.

The rock formation is sandstone, and along the banks for a considerable distance are found spherical stones in large quantities, some half imbedded in the rocky banks and others lying in great numbers along the beach. They vary in size from a couple of feet to eight or ten in diameter, and when seen partly imbedded in the bank they give the impression of having been fired into a wall by some giant mortar when the elements were at war with each other. Occasional specimens of petrified wood are found along the shore in the neighbourhood.

We remained in camp at the eddy from June 21 till the 25th, waiting till the men had got all the goods across the island and our scows and boats loaded, fourteen in all. The total number of persons making the journey, including boatmen and passengers, was 92.

About 9 p.m., on the 24th, a rumour spread through the camp that an Indian that day had killed a very large buck moose, and on the following morning eleven Indians belonging to the crew were away to bring the carcass to camp from where it had been shot many miles away; and just as we were dropping down about a mile to a lower eddy the Indians were seen coming out of the woods bearing the meat of the slain monarch of these forests. That night each of us had a taste of moose, each piece roasted on a stick before the fire, and it was really delicious. The weather continued very hot, 90 to 92 degrees in the shade, but a breeze along the river makes it endurable.

FROM GRAND RAPIDS TO FORT M'MURRAY, 87 MILES.

On Tuesday, June 26, we started in scows and large boats at 8 a.m. For some days previous the weather had been very dry and hot, but to-day it is somewhat cloudy and rain appears to be not far off. The water is still falling slightly.

The country about Grand rapids has been burned over, but as we descend the river about four miles the conditions in this respect change and there is a good covering of green timber, probably 20 or 30 years old.

We passed Burnt rapids at 8.30 p.m., and camped for the night two miles below, or some 28 miles from our start at Grand rapids.

The scenery along this day's journey has been fine, especially near the junction of Buffalo creek, which flows into the Athabaska from the north. The rocks along the high banks assume strange shapes, resembling great castles of the Italian style of architecture, but the timber here is small, very little being large enough for lumber.

Wednesday, June 27, we left camp at 7.20 a.m. It is still somewhat cloudy this morning, but very hot when the sun is not obscured. At noon we landed for lunch at the head of Boiler rapid, and started again at 1.30, and ran the rapid. A slight accident to one of the scows in this rapid delayed us till 7 p.m., when we started again, and very shortly after ran what is known as the Middle rapid. This we passed without any accident, and at 7.30 p.m. went ashore and camped for the night at the head of Long rapid. We are now probably 50 miles below Grand rapid, and 37 above Fort McMurray, where we will take a steamer again. The land along the banks to-day has not been as picturesque as it was yesterday. The land rises in terraces back from the river to a height of probably 400 feet.

The rock formation is still generally sandstone, but in certain places limestone is commencing to be seen. There is a good covering of soil, but rather too light for good crops.

The timber is small and consists of poplar, birch and spruce, but about one half the area has been recently burned over.

The water is very low, and this causes us much delay, even with our boats and scows, which draw very little water.

Thursday, June 28, we started at 8.25 and were 20 minutes in running Long rapid. At 8.55 we went ashore, as one of the boats had been injured in running the rapid and was leaking, but it was soon repaired and we started again at 9.35. In 20 minutes more one of the scows struck a stone, causing her to leak so badly that her cargo, which was assigned to Fort Resolution, was injured considerably by the water.

Here Captain Shott, who had charge of a number of boats and scows with goods for the Roman Catholic Missions, overtook us and took the lead. We got started again at 3 p.m. and passed our rival fleet.

We reached Crooked rapid at 4 p.m. In this neighbourhood limestone appears along the banks in horizontal layers.

At 4.30 we jumped a small rapid without sustaining injury to any of the boats. Along here the layers of limestone present a very pretty appearance. In some cases there are caves running in to considerable distances along the bank near the water's edge.

At 5 p.m. we went ashore for the night on the right bank, about one-third of a mile above what is known as the Little cascade.

The forenoon of this day was clear and hot, but several showers passed by us in the afternoon, and finally one overtook us and we had an hour of heavy rain. The country has been partially burned over, and the standing timber is very small.

On Friday, June 29, it started to rain at 8.30 a.m., but before this we had run the Little cascade with the cook's scow and got our tent up just below the cascade, which consists of a semi-circular drop in the limestone rock of about two feet and extending completely across the river.

To give an idea of the delay caused by trying to navigate this portion of the Athabaska with loaded crafts, even with those of very light draught, I might mention that this morning Mr. Phillips, Inspector of Hulls and Boilers, caught up to us. He had left Athabaska landing in a canoe with one man, on Monday, June 25, thus making the journey in four days which has taken us twenty to accomplish.

The weather was showery, but the men worked all day, partially unloading the scows and carrying the goods a few rods below the cascade, where they were reloaded after they had jumped the cascade with part of the cargo. Captain Shott has again overtaken us, and this serves to cause delay, as there is only one place where the boats can be let down the rapids. The water, however, has risen about 4 inches, which is hailed with delight.

Saturday, June 29. About a mile and a half below the Little cascade is what is called the Lower cascade. It is very similar in character to the one farther up the river, but the perpendicular fall in the lower one is about twice as great or four feet in descent at the present stage of water. The boats had all to be partially unloaded and let down this rapid with lines and reloaded the same as before, but the men worked with a will, and by night all the boats were over and we camped a short distance below this cascade on the level limestone shore.

The lower cascade, though higher than the upper one, caused us less delay, as the portage at the latter was much shorter, being only about three rods, and the walking was good on the rocks. The upper or little cascade, however, in high water can be run without unloading.

The timber in the neighbourhood of the cascades is small and the country has been partially burned over.

Sunday, July 1, we left camp at 9.10 a.m. Having passed the rapids, no further difficulty was experienced, and we arrived at Fort McMurray at the junction of the Clearwater at 12.45 p.m., where we found the steamer *Grahame* awaiting us.

The fall of the Athabaska between the head of the Grand rapids and Fort McMurray (87 miles according to the Hudson's Bay Company chart), is 360 feet, or something over 4 feet per mile.

Mention has been made of the bituminous or tar sands. They overlie the limestone and are found at different places along the Athabaska both above and below McMurray. They are also seen on the Slave river and through other sections of the Mackenzie River basin. Mr. R. G. McConnell, of the Geological Survey, made a valuable report on these tar sands in 1892, from which I have made the following quotations:—

'The tar sands hold in places lenticular beds of limestone, lignite seams 2 or 3 feet thick, and fragments of fossil wood. They vary in colour according to the quality of tar they contain, from a gray to a dark brown, and jet black. Where heavily saturated, streams of tar issue from the bank during the heat of summer, and form pools at the bases of the escarpments. This appears to be the origin as suggested by Bell of the tar springs which occur in the right bank opposite Tar island, two miles below the mouth of Red river as it enters the Athabaska, and in numerous other places.

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'The tar sands occur along the Athabaska valley from Boiler rapid to a point about nine miles below the mouth of Calumet river, a distance of about 90 miles. West of the Athabaska they are soon concealed by the overlying divisions of the cretaceous, but are exposed for some miles along the valleys of the tributary streams. They were not found on Peace river. East of the Athabaska they occur in heavy sections on the Clearwater, Pembina and High-bank rivers, but on Muskeg and Firebag rivers the sections are small, and the greater part of the material in this district has evidently been planed away by glacial action.

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'The tar sands, the principal bitumen-bearing formation of the district, are described in a preceding part of the report. This unique formation is of Dakota age, and constitutes in this region the basal member of the cretaceous series. It rests uncomformably on the Devonian, and is exposed overlying the latter along the valley of the Athabaska for a distance of 90 miles. Lithologically it may be described as a soft sandstone, the cementing material of which is a bitumen or inspissated petroleum derived from the subjacent limestones. The boundaries of the tar sands were only precisely defined at a few points, but they were estimated to have a minimum distribution of fully 1,000 square miles, where either completely uncovered, or buried beneath a part of the overlying Clearwater shale on the highlands, and exposed in the river valleys. They vary in thickness where the section is complete, from 140 to 225 feet. The bitumen is unequally distributed through the sands, in a few places merely staining the grains, but in most of the sections examined it is present in sufficient quantity to render the whole mass more or less plastic. The following calculation, which is extracted from the summary report for 1890, although it can only be regarded as an approximation, yet will serve to give some idea of the enormous outpouring of bituminous substances which has taken place in this region.

'"An analysis by Mr. Hoffmann of a specimen collected some years ago by Dr. Bell, gave by weight:—

Bitumen.	12·42
Water (mechanically mixed).	5·85
Siliceous sands.	81·73

'"A cubic foot of the bituminous sand rock weighs, according to Mr. Hoffmann, 117·5 lbs. This figure multiplied by the percentage of bitumen 12·42 gives 14·59 lbs. as the amount of bitumen present in a cubic foot, or $^{14\cdot 59}/_{63\cdot 7} = 22\cdot 9$ per cent in bulk. Taking the thickness at 151 feet, and assuming the distribution as given above at 1,000 square miles, the bituminous sands in sight amount to 28·40 cubic miles.

Of this mass, if the preceding analysis is taken as an average, although it is probably rather high, 22·9 per cent in bulk, or 6·50 cubic miles is bitumen. The amount of petroleum which must have issued from the underlying limestones to produce 6·50 cubic miles, or by weight approximately 4,700,000,000 tons of bitumen, cannot now be estimated, as the conditions of oxidation and the original composition of the oil is unknown. It must, however, have been many times greater than the present supply of bitumen."

'The commercial value of the tar sands themselves, as exposed at the surface, is at present uncertain, but the abundance of the material, and the high percentage of bitumen which it contains, makes it probable that it may, in the future, be profitably utilized for various purposes, when this region is reached by railways. Among the uses to which it is adapted, may be mentioned roofing, paving, insulating electric wires, and it might also be mixed with the lignite which occurs in the neighbourhood, and pressed into briquettes for fuel.

'The tar sands evidence an upwelling of petroleum to the surface unequalled elsewhere in the world, but the more volatile and valuable constituents of the oil have long since disappeared, and the rocks from which it issued are probably exhausted, as the flow has ceased. In the extension of the tar sands under cover the conditions are different, and it is here that oils of economic value should be sought. In ascending the Athabaska, the tar sands are overlaid at Boiler rapid by a cover of shales sufficient to prevent the oil from rising to the surface, and in ascending the river, this cover gradually thickens. The geological attitude of the shales is not the most favourable, as the beds dip away from the outcrop at the rate of 5 to 10 feet to the mile, and it is possible that a part, or even the whole of the oil may have flowed northwards and eastwards through the sands, and escaped where these come to the surface. It is unlikely, however, that all the oil has escaped in this manner, as small anticlinals in the covering beds are almost certain to exist, and a differential hardening of the beds themselves may serve to inclose reservoirs or inverted basins of large capacity. It is also possible that the sands at their outcrop, may by the deposition of tarry substances, be plugged tightly enough to prevent further egress. Favourable indications of the presence of oil in the vicinity of the Athabaska are also afforded by the existence of the natural gas springs referred to on a previous page.

'The question of the continuity of the tar sands and their petroliferous character under cover, can, however, only be settled in a decided manner by boring, and it is highly desirable that drilling operations should be undertaken for this purpose. At the mouth of Pelican river the tar sands are probably covered by about 700 feet of strata, and this amount increases as the river is ascended. At the Athabaska landing, if the formation extends to that point, it probably lies at a depth of from 1,200 to 1,500 feet below the surface, but the distance of the landing from the outcrop of the tar sands, and the variability in the thickness of the cretaceous formations make it impossible to give more than a rough estimate.

'Indications of the presence of oil in the district are not confined to the tar sands, as on Peace river and Lesser Slave lake inspissated bitumen was found in a number of places lining cracks in nodules, and at Tar island in Peace river, small quantities of tar are brought to the surface by a spring. Tar springs are also reported from several other points, but their existence lacks verification. North of this district tar occurs at intervals in the Devonian limestones exposed along the valleys of Slave river and the Mackenzie, all the way to the Arctic ocean.'

Before reaching Fort McMurray, and at a distance of about 4 miles above Mountain rapid, on the right bank of the Athabaska there was observed what appeared the strongest deposit of asphalt yet seen, which emitted a very distinct odour.

Fort McMurray, though not a post of very great importance at present, has a history of considerable interest. It was here that the weary traveller of one hundred years ago from far away Montreal, metaphorically speaking threw down his pack and gave a sigh of relief after a journey by bark canoe through a wilderness for a distance of over 2,500 miles.

The names of the lakes and rivers traversed are alone sufficient to excite the imagination and to fully recall what such a journey meant. The Ottawa and Mattawa rivers, Lakes Huron and Superior, Rainy lake and Rainy river, Lake of the Woods, and its outlet, the Winnipeg river; Lake Winnipeg to Grand rapids; the Saskatchewan to Cumberland; thence by devious courses across unnamed portages and streams scarcely navigable even for the bark canoe to Pelican lake, to Churchill river, up that stream for many miles; across Buffalo lake and Lac La Loche, till at last the final portage has been made and Clearwater river is entered. He has now reached one of the streams that go to swell the volume of that greatest of Arctic rivers, the Mackenzie. In course of time other and more favourable routes were established, and only a very few of the oldest voyageurs are now left to tell the tale of such an adventurous journey.

FROM FORT M'MURRAY TO FORT SMITH ON THE SLAVE RIVER, 303 MILES.

We found the steamer *Grahame* to be a very comfortable boat. She is a stern-wheeled craft, with a flat bottom similar to those used on the Mississippi and other western rivers, and considerably larger than *The Midnight Sun*. We are assured that there are no serious obstructions to navigation in the course of her route, and that our difficulties will probably be few from here on to Smith's landing on the Slave river.

We lay at Fort McMurray from Sunday noon till Monday, July 2, at 7.30 p.m., when we resumed our journey down the Athabaska. The weather continued very hot. The river widens considerably after receiving the Clearwater, attaining a width of half a mile in many places. The banks become lower, islands clothed with timber are more frequent, and the scenery for many miles as we descend is devoid of the grandeur of the Upper Peace, but is nevertheless very pretty if not enchanting.

At 9.35 p.m. we tied up and took on wood, and did not start again till 4.45 a.m. on Tuesday, July 3.

The timber is larger below McMurray, some of the spruce being large enough for lumber, and there seem to be considerable quantities of it. Lignite and asphalt are seen along the banks between Fort McMurray and Fort McKay. We passed the last-named post at 7 a.m. It is situated on the left bank of the river, and consists of about a dozen whitewashed houses, the principal ones being a Hudson's Bay Company store and the Roman Catholic Mission.

The boat tied up for the night about 30 miles from Chippewyan. On account of the sand bars in the river near its entrance into Lake Athabaska it was thought best not to attempt this part of the journey till morning.

This has been another very hot day, 100 degrees in the shade. The water has risen 2 feet. It was very muddy till this afternoon, when we got ahead of the flood. Considerable driftwood is being brought down. During the day considerable spruce timber was passed, large enough for saw-logs. The land gradually lowers as we approach the lake. Where we tied up for the night only cottonwood and willow are seen.

On Wednesday, July 4, I rose early to see the entrance to Lake Athabaska, or 'Lake of the Hills,' as it was known in the early days, and as it is always referred to by Sir Alexander Mackenzie, whose explorations down these waters to the frozen sea, and afterwards up the Peace river and across the mountains to the Pacific ocean furnish the subject of one of the most interesting narratives of adventure ever written.

The morning was exceedingly hot, the sun at 3 a.m. resembling a ball of fire on the surface of the lake; and as the day advanced its rays pierced through the clear atmosphere with scorching effect. The ground falls gradually away, willows taking the place of the cottonwood trees, then great marshes, and lastly the lake itself spreading out far to the east; a great lake in a vast wilderness without a sail to enliven it or a sound to break the solitude. But as we round a point, about 6 or 8 miles to the north, we behold the whitewashed houses of Fort Chippewyan, built on high land, or rather red granite rock. Viewed from the lake, this post is rather imposing in appearance. The Hudson's Bay Company buildings, forming a quadrangle, show up well as we approach the shore. The Roman Catholic Mission buildings are large, but lose effect from their dull colour.

We lay at Chippewyan unloading freight till 7.45 p.m., when we started, and almost at once entered the main channel of Great Slave river. For the first 8 miles the channel winds in and out through drowned land covered with reeds and grass. It is one of the greatest resorts for wild geese and ducks to be found anywhere in the world. At 9.45 the steamer tied up for the night. This has been the hottest day yet. It registered over 100 degrees in the shade at Chippewyan, but the appearance to-night portends rain, and as we retire we hear rumblings of thunder and some lightning is seen. A little later the welcome rain is heard pattering on the decks. All will welcome a relief from what deserved to be called tropical weather.

Thursday, July 5. It rained most of the night, and in the morning the air was cool and refreshing. At a distance of some 20 miles from Chippewyan the land becomes higher and is covered with timber, and considerable quantities of good spruce are seen up to 15 inches in diameter and of good height. The other varieties are poplar, birch, tamarack and willow.

At about 25 miles below Chippewyan the Peace river joins the Slave, and at once the size of the latter increases from a half-mile to a stream a mile and a half in width. The Peace, and its extension the Slave, might well be called the Upper Mackenzie. The Peace itself is really an immense river. Far west, some 800 miles from its junction with the Slave and within the Rocky mountains, the Finlay and the Parsnip, themselves large rivers, join and form the Peace. The latter then flows easterly and northerly, bringing with it large quantities of drift timber, which is seen scattered along the shores and sand bars all the way to Great Slave lake. The size and quality of this timber, much of which is spruce, affords an idea of the forests along the shores of the stream all the way to the Rocky mountains. It is no exaggeration to say that there are several million feet of spruce drift-wood piled up along the shores which would make very fair lumber.

We reached Smith's landing about 10 p.m., having lost some three hours in taking on wood and also on account of wind. The Slave river from this point to Fort Smith, 16 miles farther down the river, is not navigable owing to rapids. Boats and scows partly loaded are sometimes sent down the rapids, but for the most part the goods are transported by wagons overland across this portage. The land along the Slave from the junction of the Peace to Smith's landing is generally level, and the soil along the river is a clay loam of fair quality. Vegetables are successfully grown when proper attention is given to their cultivation. There is said to be a district of prairie country some 40 miles wide and extending from Great Slave lake to the Peace river where the soil is good. Whether this information is reliable or not I am unable to say.

The journey across the portage was made in a wagon, and took about three hours. For the first 6 or 7 miles out from Smith's landing the soil is a clay loam. We then pass through a tamarack swamp for half a mile, and from there on to Fort Smith the land is a very light sand and worthless for agricultural purposes. The timber is jackpine, some of which is quite large enough for railway ties. The timber on the heavier soil consists of black and white poplar, spruce, birch and willow of small size and little value.

We were detained from July 5 to 11. During this time, part of which was spent at Smith's landing and part at Fort Smith, the men with teams were busy getting the goods across the portage. At Fort Smith the Slave river is upwards of a mile and a half wide.

FROM FORT SMITH TO FORT M'PHERSON, 1,299 MILES.

At 3.15 p.m. Mountain or Pacific time, on July 11, we left Fort Smith on the steamer *Wrigley,* the *Grahame* returning to Fort McMurray. The *Wrigley* is a smaller boat than the *Grahame,* of a different model, and of the propellor type. She resembles one of the smaller steamers on our great lakes, being built on similar lines. She draws about 5½ feet of water when loaded.

The day is cloudy and quite cool. We are at last clear of all obstructions to navigation from Fort Smith all the way down to the delta of the Mackenzie. There is also very little darkness and the boat runs both day and night. We passed Salt river at 5.30 p.m., and Bell Rock a little after, and later also Gravel point, where we saw the last gravel to be met with in our journey north on these waters. The country is level, the banks rising at first to a height of 30 or 40 feet, but gradually getting lower as we descend the river.

Thursday, July 12. The boat ran all night, and at 8.30 a.m. we were opposite McConnell island. Below Fort Smith islands are more numerous and increase in size as we approach the mouth of the river. The land falls away till it becomes submerged, and at last by careful piloting we reach Great Slave lake at 2 p.m. Here we wait till the lake becomes calmer, then start for Fort Resolution some miles distant in a bay west of the mouth of the river. During our journey of the past two days the soil along the river was apparently a good, rich clay loam, but an indication of our approach to an Arctic climate was afforded by the appearance of frozen earth along the banks. As the earth thawed and was washed by the water, arches were formed extending under the surface of the ground and considerable distances from the shore. The outlet into the lake is obstructed by deposits of earth brought down the river. The pilots here have great difficulties, as the channel is annually changing, and we had the misfortune of being grounded just when it was thought we had reached deep water, which delayed us a few hours, but we got off without receiving any injury, and reached Fort Resolution at 10 p.m. This is a whitewashed village and, like many others of these posts, looked better at a distance than when within its limits. What added to the picturesque appearance of the place was the large number of Indian tents on the plateau between the water and the buildings. Mr. Conroy was here 'paying treaty,' as it is called, to the Indians of this part of the country, and as usual, this event had brought together the population of the whole surrounding country, including women and children and their dogs.

At Fort Resolution I saw several small gardens containing potatoes, beets, turnips, cabbages, peas, &c., so well advanced that by August 1 the potatoes should be fit for use.

Friday, July 13. The boat lay at Fort Resolution till 2.30 a.m. this morning. We have now reached a latitude where there is no darkness at this date; simply twilight for a short time. The run from Fort Resolution to Hay river, a distance of 70 miles, is all in the open lake and delays are frequently experienced, especially when the steamer has in tow scows heavily laden and incapable of weathering gales that frequently occur here. We were compelled to seek shelter in the lee of Burnt island, where we remained from 6 a.m. till 4 p.m., when the sea having abated we started again and reached the mouth of Hay river early on Saturday morning, July 14. At this place the Rev. Mr. Marsh, of the Anglican Church, has a mission and school that are being very successfully conducted under his supervision.

The land here, like most along the lake and Slave river, is of good quality, being a clay loam. A garden containing vegetables similar to those at Fort Resolution, though not quite so far advanced, was seen at this mission.

We left Hay river at 8.30 a.m. and had a calm sea and good run of some 40 miles to the entrance of the Mackenzie river, which we reached at 2.30 p.m. There is a bar at the entrance, but as the channel had been recently buoyed we had no great difficulty in getting through, though the steamer touched a rocky bottom once or twice.

The land is low at the entrance, and covered with spruce and tamarack of a small size.

Great Slave lake impresses one with its size, similar to that of our great eastern lakes. We were at one time entirely out of sight of land. For some distance from the mouth of Slave river the water of the lake is muddy, caused by the sediment carried down the river, but this large body of water acts as a great filtering basin, and the water soon becomes quite clear. The Mackenzie for some miles below the lake is very wide. In some cases the expansions deserve and receive the distinction of lakes. Islands covered with green timber are numerous and the appearance is suggestive of the lower St. Lawrence. We had some difficulty in following the channel at the mouth of one of these expansions, named Beaver lake, where we grounded twice on a soft bottom, which did no damage but caused several hours' delay.

On Sunday at 6 a.m., July 15, the blowing of the whistle announced that we were approaching Fort Providence, which is on the right bank of the Mackenzie, about 40 miles down from Great Slave lake, and 917 miles from Athabaska landing.

The village is very prettily situated. The Roman Catholic Mission at this point is an important one. The mission buildings, consisting of a church and convent, are quite imposing, and the garden is a surprise to the traveller in this far northern district. In it were seen peas fit for use, potatoes in flower, tomatoes, rhubarb, beets, cabbages, onions; in fact about the same as we would see a thousand miles further south. Besides the vegetables, were cultivated flowers and also fruit, such as red currants, gooseberries, strawberries, raspberries and saskatoons. But most surprising of all was, near by, a small field of wheat in the milk, the grain being fully formed. I was informed that it had been sown on May 20. I was anxious to know whether this grain had ripened, and was fortunate enough to learn later from one of the passengers who, returning by the *Wrigley,* had visited the same field on July 28, that he found it had been harvested before that date, probably in about two months after sowing. This seems almost incredible, but when we remember that during this whole period it had been subjected to almost constant sunlight and heat the reason for its rapid growth is obvious.

The banks of the river here are about 30 feet high. The land appears level and the soil is a rich deposit of clay loam, and this is the general character of the soil along the whole course of this great river.

Leaving Fort Providence at 10.40 a.m., we soon enter 'The Little Lake,' one of the numerous expansions of the Upper Mackenzie. At 10 p.m. we reached a point known as 'The End of the Line,' so named from being the place where the boatmen coming up the river could dispense with the tracking line. As the river widens above this point the current decreases so that boats and canoes can be propelled without outside assistance, while below here till the river widens again near its mouth, a distance of over 800 miles, the current is too swift for the general use of oar or paddle, and the line is necessary.

One notable characteristic of these northern rivers is that, though the rapids are not numerous, the current is generally so strong that it is only waste of time and energy to attempt to propel any craft against it, not driven by steam, without assistance from the shore. The Indians and half-breeds take very kindly to the work of tracking, but I question if any other people in the world would be willing to endure what this work necessitates. The winding shore has to be traversed where no work has ever been done worth speaking of to smooth the course. Rocky banks and clay cut banks have to be passed and tributary streams waded or swam; but the native trackman, without complaint and without profanity, seems to look upon such work as his to do, and fortunate it is that he is so persuaded.

On Monday, July 16, at 7 a.m., we arrived at Fort Simpson, in latitude 61° 52′ N., 161 miles below Fort Providence and 1,078 from Athabaska landing.

It is prettily situated on the left bank of the Mackenzie just below the mouth of the Liard. I was sorry to see that the clear Mackenzie had to be polluted with the muddy water brought down by the Liard. Evidently the latter has not the advantage of a filtering basin such as the waters of the Mackenzie have in Great Slave lake. The banks of the river at Fort Simpson are about 30 feet in height. The soil resembles that at Fort Providence and the vegetable gardens are similar to those seen there. The increased sunlight and heat as we proceed north counterbalance the disadvantages of the higher latitude. Fort Simpson has been regarded for many years as the most noted of the Hudson's Bay Company's posts in the north, and though it has, I believe, lost some of its importance, it is still a centre of trade for a wide district of country. It certainly can boast of one distinction which no other place of its latitude on this continent can. The Hudson's Bay Company have installed a system of electric lights for their buildings. There is also here a museum containing exhibits of the animals and birds of the country. In addition to the buildings of the company and those of its employees, there are several other houses, and besides these the Church of England mission building, consisting of a frame church and large dwelling nearby. The latter is used both for the residence of the clergyman in charge, and also for a school which he conducts.

The timber along the Mackenzie so far is smaller than that found along the Slave river, but nevertheless it is of sufficient size in some cases for lumber. There is a small saw-mill at Fort Simpson, not now running, at which lumber 12 inches in width was cut and used in buildings at this post. One cannot but be struck with the vast quantity of spruce along the route traversed, which is a little under size for lumber, but would make excellent pulpwood. The driftwood coming down the Liard is similar to that from the Peace, and indicates timber of a larger size farther up the stream than is found near its mouth.

On Tuesday morning, July 17, at 5.30, we left Fort Simpson and at 9 a.m. caught the first sight of the Rocky mountains (Nahanni Range), with their snow-capped peaks. It strikes the observer as extraordinary that the Mackenzie in selecting a course to the sea should have chosen a direction so far to the west as to necessitate its cutting its way through one chain of these mountains when a much shorter course lay open to the east where no such difficulties apparently exist. Probably all this is easily explained. The task at all events has been accomplished apparently without difficulty, and the traveller has reason to be thankful, for it affords him scenery so different from what he has seen for a thousand miles back that he can almost fancy he is again in British Columbia.

In the afternoon it rained and then turned decidedly cool, a great change from what we have had for some time. We arrived at Fort Wrigley, 136 miles from Simpson and 1,214 from Athabaska landing, at 9.20 p.m.

This is a new post on the left bank of the river 25 miles below the old post of the same name. The change was made owing to the locality of the latter proving very unhealthy.

The country about Wrigley is wooded. I noticed a spruce log cut near the post that was 20 inches in diameter.

The Nahanni flows from the west and joins the Mackenzie about halfway between Fort Simpson and Fort Wrigley. Just north of it rises Mount Camsell, a snow-clad peak of the Rockies, 5,000 feet high.

I am informed that there is considerable spruce up the Nahanni river, of sufficient size for lumber, though not so large as that which grows along the valley of the Liard. A man who had explored the latter stream assured me that he had never seen finer saw-log timber anywhere, except on the Coast, than along the valley of the Liard. He also said that good birch was found there, which is highly prized by the Indians for bark for their canoes.

Below Wrigley the river narrows to from a half to three-quarters of a mile in width. This continues for some distance and then widens out as we proceed down stream. Two noted mountain peaks, known as Mount Bompas and Mount Wrigley, are seen between Wrigley and Norman. About 20 miles above Fort Norman, and on the left side of the river the clay banks assume a very red appearance, and the people use the earth as a paint. This condition of the earth has been produced by fire in the coal seams. For several miles along the route the fire is now apparently extinct, but as we reach a point 8 miles above Fort Norman, for upwards of 2 miles along the right bank of the river smoke is distinctly observed from fires still burning far down in the seams of coal, or rather lignite.

It is worthy of note that Sir Alexander Mackenzie makes mention of these fires in his narrative as existing in 1789, when he explored and gave his name to the river, and the natives say it has been burning ever since and for an unknown period of time before.

About 60 miles below Wrigley we pass the mouth of Salt river, which flows from the east. It is so named from deposits of salt that exist some miles above the mouth. Rock salt is said to exist on the Great Bear river above Norman, but the greater part of that used at the posts is brought from the other Salt river, which has already been referred to as flowing into the Slave river from the west below Fort Smith.

At 7 p.m., July 18, we reached Fort Norman at the mouth of the Great Bear river, which is the outlet of Great Bear lake. Fort Norman is distant from Fort Wrigley 184 miles and 1,398 miles from Athabaska landing. Its situation is very picturesque. The mountain peaks stand up in bold relief out of a vast level plain. Bear mountain, on the north side of Great Bear river and east of the Mackenzie, is the most conspicuous.

It was 11.30 p.m. when we left Fort Norman, but there was no darkness, only a subdued light such as we have in more southern latitudes shortly after sunset. The steamer ran all night, and on rising on the morning of the 19th, we were over half way between our last port and Fort Good Hope. Between Norman and Good Hope we have mountains on both sides of the river, and as we approach the latter and at about 6 miles above the port we enter the 'Upper Ramparts of the Mackenzie.' The great river is here contracted for some 4 miles to a width of about a quarter of a mile. On each side rise perpendicular walls of limestone rock to a height of from 100 to 300 feet, which resemble huge fortifications. The river is here very deep, and a mile or two below the ramparts, where it takes a sharp turn to the left, Fort Good Hope appears in view like another Gibraltar, securely guarded, but where no foe ever approaches.

At 3.30 p.m. we reached Fort Good Hope, 174 miles below Fort Norman, 1,572 from Athabaska landing and only 26 south of the Arctic circle. Its situation on a level plateau is charming. The banks are about 30 feet high and the soil is similar to that all along the river, being a rich deposit very much resembling the soil of our great prairies. I saw potatoes in flower, cabbages, onions, beets, &c., in the gardens, and on an island nearby very good spruce timber, which is cut into lumber by whipsaws.

The steamer left Good Hope at 1 a.m., July 20, and when we arose in the morning we found we had passed the Arctic circle hours before. The banks of the river are getting lower, the river widens, and we are fast drifting down towards the Arctic sea.

Some time in the evening we stopped at Arctic Red River post at the mouth of a stream of the same name. It struck me as the least desirable place to live in of any in all this northland. A few houses, the church and the graveyard are all crowded on the side of a hill. Perpetual frost is only a foot below the surface and we no longer see that emblem of civilized life, the vegetable and flower garden, that has gone so far to make many of those lonely posts seem somewhat cheerful. We only stopped an hour or two at this post, and then started for our last and the most northerly post in the country, Fort McPherson.

About 1.30 am., July 21, I rose as we were rounding Point Separation, so named from the parting here of Sir John Franklin and Dr. Richardson when they separated for their perilous trip around the shores of the frozen ocean. The sun was just skirting the northern horizon, and I endeavoured to take a photo' of it, which I am afraid was a failure. Point Separation lies between the junction of the Mackenzie and Peel rivers. Below this point is the delta of the Mackenzie, which is many miles in width, with numerous islands between here and the sea, which is some 80 miles distant. At the point where Franklin and Richardson were camped are two spruce trees, which were marked as lobsticks at the time of their separation and in commemoration of that event. Both are still standing, though one of them is dead. Judging from their appearance at a distance I would say that they are each about 16 inches in diameter and 70 feet in height, and this nearly 100 miles beyond the Arctic circle. I have been very much interested in the tenacity of life as shown in the growth of trees under the adverse conditions prevailing in this north country. Since crossing the Arctic circle we have seen no vegetables, but trees such as the spruce, birch, tamarack and willow are seen all the way, and as we round Point Separation and ascend Peel river, spruce lines the banks. It attains a size of 12 to 16 inches, and is used at Fort McPherson not only for their log buildings, but also is whip-sawed into lumber for general use.

After entering the Peel river the steamer stopped to take on wood, which delayed us a couple of hours, but very soon after starting we beheld on the high banks of the east side of the river the houses of Fort McPherson, with the white tents or tupics of the Esquimaux on the beach below. These Esquimaux had come over in their whale boats from Herschel island, in the Arctic sea, to meet the *Wrigley*. Their complexion is almost white, with a dash of ruddy colour that indicates good health. They seem very cheerful, are not at all diffident or stoical like many of our Indian tribes. On the contrary, they are very inquisitive, and disposed to make themselves almost too familiar. They are of fair stature, and do not show any of the marks of the struggle for existence that is observable in their neighbours, the Indians, in this part of the country.

At Fort McPherson, as at all the points visited for the last 1,300 miles of our journey, no news from the outside world had been received since the last winter mail in March. For over four months the news received was purely local, and generally consisted of reports from a few posts in the surrounding country, from hunting parties returning from their winter quarters, and from the whalers entrapped by the ice in the sea at Herschel island. We were the first to inform them of the eruption of Mount Vesuvius and the San Francisco earthquake, both of which had happened months before. Another message was one of sadness to all in this district. It was the death of Bishop Bompas, who was well known and evidently highly esteemed by all.

The *Wrigley* remained at McPherson, or Peel's River post, as it is generally called here, from Saturday morning till 2 a.m. on Monday, July 23, when she started back on her long journey of 1,300 miles, or, to be exact, 1,299, to Fort Smith, most of the passengers returning with her. The total distance from Fort McPherson to Athabaska landing by the route taken is set down as 1,854 miles, or 1,950 miles to Edmonton.

A few words regarding Fort McPherson may be of interest. It is, as before stated, the most northerly of the Hudson's Bay Company's posts. Its latitude is 67° 25′, and it is truly an Arctic village. The sun never sets for about six weeks in summer and is constantly below the horizon for the same time in winter. The thermometer went as low as 68 degrees below zero (Fahrenheit) last winter.

The inhabitants are in close touch with the Esquimaux of the Arctic sea and with the whaling ships that annually visit these waters. These whalers are mostly from San Francisco, coming up through Behring's strait in the summer, and returning again in the early fall. Last season most of them were entrapped by the ice that blocked the straits and were compelled to remain there for the winter. They went into winter quarters at Herschel island, where there is a detachment of the Royal Northwest Mounted Police. They were not sufficiently supplied with provisions for this emergency, and had to rely largely on what could be obtained in the country. They engaged the Indians of the mainland to supply them with meat from the chase, principally moose, with the result that the shipment of fur this year from the post at McPherson was very much smaller than usual.

The report by the whalers of the ice conditions of the summer of 1905 is of interest to Arctic navigators. They say that the ice that drove into Behring's sea from the northeast and prevented their exit left that part of the ocean almost free of ice, a very unusual thing; and one of the captains is reported to have said that he was strongly tempted to set sail for the pole, as in his experience of twenty or twenty-five years he had never seen what seemed so good an opportunity of winning fame by such a venture. But he said his commission was to capture whales and not the pole. That these reports are correct is borne out by the fact that Captain Amunsden, who was exploring along the northeast coast, finding open water to the west set sail in that direction, and to his surprise soon found himself in the company of these whalers near the mouth of the Mackenzie. He was compelled to go into winter quarters, and laid up with them at Herschel island till this summer, when he succeeded in getting out through Behring's strait, being the first to make the entire northwest passage. During last winter he made an overland journey out to the Yukon and returned again to his ship, the *Gjoa.*

SPECIAL NOTES ON THE TIMBER OF THE MACKENZIE BASIN.

It may be well for me to add to the foregoing report a few observations dealing specially with the timber in the Mackenzie basin, and also a map with additional notes thereon.

Varieties.—As we go north, the varieties of trees greatly decrease in number and in the sub-Arctic forest belt they are reduced to eight species, namely, white spruce (*picea alba*), black spruce (*picea nigra*), larch or tamarack (*larix Americana*), jack or Banksian pine (*pinus banksiana*), Canada balsam (*abies balsamea*), aspen or white poplar (*populus tremuloides*), balsam poplar or balm of Gilead (*populus balsamea*), and canoe birch (*betula papyrifera*).

The first five of these belong to the coniferous family, while the last three, namely, the aspen, the balsam poplar and the canoe birch, are of the broad leafed variety.

In addition to these are various species of willow, extending throughout the whole region, but they are too small in size to be classed as trees.

The larch or tamarack continues pretty well north to prefer the swampy land, but as we approach the Arctic regions it attains its best growth on higher ground.

The black spruce also follows the example of the tamarack in this respect, while the white spruce thrives best on the higher and dryer land throughout the whole of the subarctic watershed. The tamarack vies with the white spruce in enduring the Arctic climate and is found almost to the limit of tree growth.

The wood of the tamarack is harder and better than the spruce for purposes where strength and durability are required. It is also the best, perhaps excepting the birch, of these northern species for fuel. Though widely distributed it is only found in limited quantities here and there in scattered patches, whereas the spruces of different varieties are found in almost every part of Canada from the Atlantic to the Pacific and from the southern boundary of the Dominion to the tundra and frozen land beyond the Arctic circle.

It would undoubtedly be misleading, with our limited knowledge of the greater part of the country, to attempt to define the areas that may, with the settlement of the country, offer profitable fields to the lumbermen. It is true that there has been for many years a good deal of travel through the country, but the routes taken are mostly confined to the great water courses. While in the country I made diligent inquiries from those I met who are engaged by the companies and who take the place of the old *coureurs du bois* of the early days in 'tripping' in winter, visiting the hunting lodges of the Indians to get furs. Occasionally some of the information obtained seemed valuable, but even these routes or dog trails, are always chosen where there is the least timber to obstruct the course, generally along the lakes and rivers or through level and sparsely timbered muskegs. The Indians, being interested in the fish and game of the country, can give reliable information concerning them, but it would be unwise to make any calculations from what information can be gained from them regarding either the quantity or quality of timber in the country.

I am more than ever impressed with the view that I have long held, that no more judicious expenditure of public funds can be made than what would be involved in a regular system of exploration of our unoccupied lands.

So far as our present knowledge affords us a means of judging, the whole of the Arctic basin, except the barren lands of the far north and certain limited areas in the watersheds of the Athabaska and Peace rivers, which latter are prairie, may be correctly described as forest lands.

It must not be inferred that the whole of this vast area is timbered in the same sense that Ontario and Quebec were in their primeval state. The timber is not as large, and by no means as evenly distributed. Very frequently after proceeding a mile or less from one of the large rivers we will enter a muskeg with only a few small scattered spruce and tamarack here and there dotting the landscape. This will probably continue till we approach a small stream draining the muskeg, and as we pass down such a stream we will frequently find very good spruce, poplar and birch along the banks and extending for varying distances to the right and left.

From the information at hand I think it quite safe to assert that the largest extent of timber in the Mackenzie basin, as well as the largest in size, is to be found along the tributaries of the Mackenzie which flow from the west, such as the Athabaska, the Peace, the Liard, the Nahanni and others. It must be remembered that these are themselves great rivers with many tributary streams, and the aggregate quantity of spruce, which is the principal timber tree in that region, must be very large; while trees of the same variety large enough for pulpwood are found in great quantities throughout the whole of the Mackenzie waters and extending all the way down to the delta of that river.

The spruces of this region are of two varieties, namely, the white and black spruce; the former is the larger and more valuable. Both varieties when accessible are now becoming very valuable, as they furnish the best material for the manufacture of pulp, and this district contains a world's supply of such timber of a sufficient size for that purpose. At present there is no outlet for this supply, but if a railway were built between Athabaska lake and Fort Churchill it would open a pulp district extending from tide water to the Rocky mountains.

FROM FORT M'PHERSON TO FORT YUKON, PROBABLY 500 MILES.

Following out my intention of 'coming out' by a different way, I allowed the *Wrigley* to leave on her return trip without me. The only other practicable summer route is by way of the Porcupine and Yukon rivers, and this was the one chosen. It would be a very good route indeed were it not for the part from Fort McPherson to the Bell river, a tributary of the Porcupine. This can be made either by following up the Rat river from its junction with the Peel to near its source in the mountains, and then making a portage of a few miles into one of the small branches of the Bell, or by going overland across the mountains by a portage of 82 miles to Bell river near La Pierre House. I had intended going by the former and had chosen a good Peterboro canoe for the purpose, but as the Indians from near Rampart House had come over the portage and were returning that way and would assist me as far as Rampart House, I decided to go with them. They reported that owing to the dry weather Rat river was almost impassable, but that the portage was on that account better than usual.

With the kind assistance of Mr. John Firth, the Hudson's Bay Company's agent at McPherson, I was able to make a bargain with the Indians to pack my outfit over this 82-mile portage and to take me from there on down to Rampart House; and on the afternoon of Tuesday, July 24, we crossed the Peel river and started up the trail. Part of our outfit was carried by the Indians and part by their dogs. A good dog will pack thirty or forty pounds quite easily.

For a distance of a few miles from the Peel the country is partially wooded with spruce, birch, balsam-poplar and willow; but after this the route is through an Arctic swamp, and the only timber is that found skirting the shores of the small streams on the way. The trail takes a westerly course through a pass in the mountains which seems as well chosen as possible. There is no mountain climbing, but until we are perhaps two-thirds of the way over there is a constant gradual ascent which is very wearying to the traveller, especially if he has a load to carry. Though the hot summer had made the trail dryer than usual there was nevertheless a great deal of wading and trying to walk on the hummocks or *têtes des femmes,* which latter is a rather unsatisfactory exercise in gymnastics. There need, however, be no fear of getting mired in any of these bogs, for at about 8 or 10 inches beneath the moss we reach perpetual ice or frozen earth.

It was a little after 5 p.m. when we started on the trail, and when we had gone about 7 miles it commenced to rain, and we camped for the night.

The next day, July 25, it took us some time getting our things dried, and we did not start till 11 a.m. We travelled till 8.30 p.m., when we camped on the bank of a stream about 25 miles from Peel river. The trail is in the valley of Lapierre or Stony creek, which flows easterly to Peel river, and is south of the trail. We forded one small tributary of this creek about 3 miles east of the one where we camped. A narrow fringe of spruce, balsam-poplar, willow and canoe birch is seen along Stony creek.

The stream at our camp was about 2 rods wide and 15 inches deep at that time, but evidently it is one of considerable importance at other seasons of the year.

On July 26 we started at 9 a.m. and travelled till 7 p.m., making about 18 miles, and crossing another small stream in the afternoon. Our course lay westerly up the same valley with Stony creek still far below us to the left. The day was quite cool and the night decidedly so. We are now well up the mountains and snow is seen in the ravines.

We left camp at 8.30 a.m. on Friday, July 27, and at 1 p.m. we reached the Great Divide, which in the pass is 2,630 feet above the sea. The mountains on each side, which are of sandstone, are from two to three thousand feet above the pass.

Shortly after passing the Divide we crossed a small stream which flows into one farther south similar to Stony creek, but of course flowing west. Our course was down the valley of this stream and to the north of it. Another cool day and no mosquitos. We passed over some snow along the sides of the hills, but without the least difficulty, as it was almost as hard as ice. After passing the summit, though the descent is scarcely perceptible to the eye, the difference is soon felt by the traveller, the walking being much less fatiguing. After making some 18 or 20 miles we camped again beside a stream.

On Saturday, July 28, we started at 8 a.m., and at once forded the stream by which we had camped and in the valley of which we had been travelling since crossing the Divide. It was of considerable size, but at this season was easily forded. Four miles farther on we crossed this stream again.

The weather is still cool and there are no mosquitos. The mountain scenery here is beautiful. Though the peaks are not so high as in the Rockies farther south, they probably reach 5,000 feet above sea level. No large glaciers are seen, but considerable snow remains the year round on some of the peaks. At noon to-day a high mountain lies directly in front of us, with valleys to the north and south of it.

We travelled on, following the trail as it bore off to the north, and finally came to the same stream again, which we crossed for the last time, now flowing to the north. The current was very rapid. The water was about 18 inches deep and the fording the most difficult we experienced anywhere on the trail. We camped immediately after making the crossing.

On the following morning we passed through a very bad swamp and then down the side of a long, steep hill partially wooded, and at 11 a.m. reached the Bell river at the end of the portage.

On our journey across we found growing in the swamps a large quantity of berries of the variety *rubus chaememorus,* which the Indians called nuckles. They grow on a very low bush in the moss and are about the size of a large raspberry. They are granulated, the grains often numbering twenty or more on a single berry. They are of a white colour until ripe, when they become a light yellow. The Indians seem very fond of them. We also saw several patches of blueberries, which were beginning to get ripe at this time.

It was pleasant to see the calm waters of the Bell in front of us and to realize that by our journey of four and a half days we had reached the waters flowing to the Pacific ocean.

The bark canoes left by the Indians on their way east were found, and we were soon making 4 or 5 miles an hour down this fast flowing stream. I had been assured that one of the canoes was large and quite capable of carrying two men and a lot of 'dunnage,' but it was about the smallest of its species for such a load I had ever seen, and from the start all the way to Rampart House, a distance of over 200 miles, my time was fully employed in sitting perfectly still. I had expected to have a seat in the bow, and the pleasure of paddling, but these crafts are not 'built that way.' They are long, but very narrow, so narrow in fact that the only place wide enough for a seat is in the centre, and I was compelled to sit very close behind the captain of the craft, and too near to use a paddle without interfering with his, which at every three or four strokes he changed from one side of the canoe to the other in order to keep it in its proper course.

The afternoon was cloudy, with some rain, but the Indians were anxious to get home and we kept on till 10 p.m., probably making 25 or 30 miles from where we started with the canoes.

The Indians killed three young wild geese, which made us an excellent supper.

On Monday, July 30, rain delayed our starting till 9 a.m., and at 10.20 we were at the mouth of Bell river and entering the Porcupine. The Bell, from where we entered it to its junction with the Porcupine, is about 20 rods wide and without any rapids or other obstruction to navigation. The current, however, is strong, similar to that in most of these northern rivers.

A fringe of timber, mostly small spruce, lines the banks, but apparently does not extend far back.

The Porcupine at the mouth of the Bell is about 60 rods wide and the current somewhat stronger than in the Bell.

The day was cool and cloudy, with occasional light showers, but the Indians cared not for these and paddled very hard all day and till 9.30 p.m., when we reached the mouth of the Driftwood river, probably over 50 miles from our start in the morning. The land along the route so far has been clay, sand and gravel, but no matter what its quality the climate forbids successful agriculture. At less than a foot below the surface the ground is frozen even through the hottest summer months.

On Tuesday, July 31, we left camp at 7 a.m. and made a long journey of upwards of 50 miles to Old Crow river, arriving there at 7 p.m., and killing eight or ten geese on the way. A raw wind with showers made travelling very uncomfortable the whole day, but the Indians had set their hearts on reaching their home that night, and nothing would stop them.

Both the Bell and Porcupine are very crooked, so much so that the distance following the windings of these streams is probably three times as great as it would be in a straight line, and while the wind assisted us on certain stretches this was more than counterbalanced by the delay it caused us on others, and besides I was in constant fear that our frail craft would be swamped.

The cut banks of the Porcupine, when seen at a distance, especially through a haze or fog, take on the most fantastic shapes, frequently resembling great buildings of all styles of architecture, and it is impossible for me to describe an illusion of this kind that met our view as we approached the Indian encampment at the mouth of the Old Crow. It was a cloudy, hazy evening with almost a gale of wind from the north, and as we rounded a point leading up to the encampment a great city appeared a few miles away, with wharfs and vessels in front and buildings of various kinds extending far back from the shore. There was a fine church, with its spire so real in appearance as almost to persuade me that my Indians had been too modest in not informing me of their great advance in architecture. This illusion was kept up for fully half an hour, though varying somewhat in appearance. I watched the panorama till finally through the haze one portion of the bank after another gave up its fancied appearance and resumed its true character, when, instead of the castellated city which I had pictured as the home of these Indians, we saw only about forty half-starved creatures all out on the high bank to welcome us, while behind among the trees were a dozen dilapitated tents, the whole surroundings indicating want and starvation, sickness and a struggle for existence, known only to those who are condemned to live in this Arctic land, and whose very existence is dependent on the exigencies of the chase.

I was assured before leaving McPherson that it would only be necessary to take sufficient supplies to last my Indians and myself as far as Rampart House, and on reaching Old Crow they were nearly exhausted, so I was in poor condition to meet a whole band of hungry beings who always expect a feast when a white man visits them. The only thing I could do was to promise that I would send a present back to them from Rampart House. They had no flour, and my intention was to get some for them there, but this I was unable to do. The supplies had not yet arrived, and there was no flour to be had, so I sent them some tobacco and tea, which are both considered prime necessities; next come meat and fish, and then flour. An Indian camp is always said to be in a starving condition if it has no tea or tobacco.

I might observe here that once we cross the mountains and enter the waters flowing into the Pacific, one of the principal topics of conversation is the salmon. If it were not for the salmon, the moose and the cariboo, existence in these regions would be impossible.

It was long after midnight before the people of the village (if such a term is applicable) retired to rest; there was so much to talk about and so many anxious listeners to the tales that the travellers had to tell. There was the death of Bishop Bompas, at Caribou crossing, conveyed by a letter from the Venerable Archdeacon Macdonald, of Winnipeg; the death of Mrs. Christie, of Fort Simpson; the San Francisco earthquake; with all the local news from McPherson and the surrounding country.

The weather cleared up during the night, and on Wednesday, August 1, the view when I rose was really charming. Our camp was on a point on the river some 40 feet high, and below the calm waters glistened in the sunlight like a sea of glass. What a change from last night, when these same waters, angered by the north wind, threatened our little canoes and caused me an hour of downright fear such as I had never before experienced. For miles and miles the river could be traced winding through the valley land, while away beyond, the mountains were seen with their snow-clad peaks, one beyond the other as far as the eye could reach.

We left Old Crow at 10.30 a.m. Our party, which hitherto had consisted of three Indians with three canoes, was now reduced to two, one of the Indians with his canoe remaining at their camp. After the most pleasant day yet experienced on the journey, we camped for the night on the bank above Blue Fish river, which flows into the Porcupine from the south. The Porcupine is here about 60 rods wide, and the water is somewhat clearer than further up the stream. The banks are some 30 or 40 feet high, with very little timber of any value to be seen.

On Thursday, August 2, another lovely summer day, we left camp at 8.45 a.m. In a few hours the river narrowed to less than half its usual width. The current increased, carrying us along almost at steamboat speed, but without any broken or turbulent water to cause uneasiness. We were in the upper ramparts of the Porcupine. Though not to be compared in grandeur with those of the Mackenzie, they nevertheless possess characteristics that are entirely unique. The stream winds around between sandstone banks, and at every turn as we descend new scenes open up to view that are very tempting to the photographer. At noon we saw a tent on the beach occupied by a white man, the first we had seen since leaving McPherson. Shortly after this we reached Rampart House, which is just east of the Alaska boundary line. It was formerly a post of the Hudson's Bay Company, but is now occupied by Mr. D. Cadzow, an independent trader. I here dismissed my Indians, and engaged a man with a boat of comfortable size to take me down to Fort Yukon, at the mouth of the Porcupine, 225 miles distant.

GENERAL REMARKS.

As we are now passing out of Canadian territory, a few general remarks regarding the resources of the district passed over, and of the condition of the Indians and others who make their home there, may be appropriate.

I have already made frequent mention of the soil and its capabilities, and also of the timber so far as could be ascertained from a somewhat hasty journey through the country, and I shall not have much further to say here on these subjects. I have also touched on the evidences of certain minerals, such as coal, petroleum and salt. But we are dealing with a vast and almost entirely unexplored wilderness, and it is scarcely probable that it is without much undiscovered mineral wealth. Such products are not confined to southern latitudes, as the riches of the Yukon and Alaska go to prove. The fish in these cool northern waters, as might be expected, are for the most part of excellent quality. They are found in abundance in all the northern lakes and rivers, the whitefish (*coregonus*) being the most widely distributed. The pike (*lucius*) is also pretty generally distributed. The fresh-water ling (*lota*) and the Arctic trout, sometimes called Back's trout, are all found in many of the northern lakes and rivers. The inconnu (*stenodus*) is peculiar to the Mackenzie river. It was named 'inconnu' (unknown) by Sir Alexander Mackenzie's exploring party, as it was to them an unknown fish. It is a good fish, and the largest of any of the species found in the Arctic watershed.

As before stated, the salmon is the great fish of the Pacific waters, and of it there are a great number of species. Among them are the king salmon, in Alaska and the Yukon; the spring salmon and the sock-eye or blue back, called also the red fish of British Columbia. The last-named is the most valuable for canning purposes, on account of its flavour and for the deep red colour of the flesh. Another species, called the coho or silver sides, is of less importance than the sock-eye, on account of the colour. It is generally frozen. The dog salmon reaches a considerable size. It is chiefly salted for the Japanese market. The hump back is seldom over five or six pounds in weight. It is chiefly used by the Indians. One of the very best fish found on the Pacific coast is the steel head. It is large, weighing from twenty to forty pounds. It is unlike in appearance any of the other salmon of the west, and exactly resembles the salmon of eastern Canada and Europe. It is very good for cooking, and is pronounced one of the most delicious of fish.

One of the resources to which I have not yet referred is the wild animals that find a home in the wilderness. Among them are the moose, the caribou, the bear, the wood buffalo and the musk ox, and a large number of the fur-bearing animals, such as the beaver, marten, fox, mink and many others. It is unnecessary to say that had it not been for these furs it is probable that this sub-Arctic region would never have been visited except by a few adventurous explorers and missionaries. Attracted, however, by the value of the furs, the Northwest Company and the Hudson's Bay Company were early in the field, and to-day, in addition to the latter, there are a large number of independent traders whose agents traverse practically the whole country, and if records of their journeyings could be collected, very interesting information of great value would be obtained. There is a virgin field here for any adventurous author who wishes to gather details at first hand.

But I must confine myself to the purpose of this report, and I desire to say that if for nothing else, this region may for all time be of great value to the Dominion for the furs it produces. There seems to me no reason why the productiveness of this country in this respect may not be vastly increased by proper methods. This may not be practicable yet, but in the future, with the constantly increasing value of furs, it will certainly be found profitable to maintain preserves where the game and fur-bearing animals will be protected and the returns greatly increased by prudent management.

Interesting as are the natural characteristics of the country and its undeveloped resources, the inhabitants who make their home there are at least worthy of some attention. In the region traversed between Edmonton and Fort Yukon we meet with several tribes of Indians, speaking as many different tongues. The first of these as we go north are the Crees, the Knistineaux of Mackenzie. Then as we reach Athabaska lake we have the Chippewyans; next the Slaves, and lastly the Loucheux. The Cree, the Chippewyan and the Slaves, though differing much in speech, resemble each other in character and appearance; but when we come to the Loucheux we seem to have reached a different type and one more closely allied to the eastern Asiatic than to the American Indian. They inhabit the country of the lower Mackenzie down to the sea and west along the Porcupine and lower Yukon. They are rather short of stature and dark in colour, are very inquisitive and seem much disposed to imitate the white man. They are very devout in their religious observances, most of them being members of either the Anglican or Roman Catholic church.

Any narrative of travel would be most incomplete that did not make reference to the missions of these two churches in the far north. At Chippewyan, Providence and Good Hope, the Roman Catholics have fine buildings and large schools, as well as at other points, while the English Church has established itself at most of the posts. They also have schools at Fort Simpson, at Hay river, and I believe also at several of their other missions.

The Indians, the half-breed, the white trader and his employees, and the missionaries constitute the very scattered population of that vast region between the borders of civilization on the south and the Arctic sea on the north. To endure the rigorous climate, the isolation from civilized life, with starvation constantly to be feared, and the many deprivations incidental to the wilderness, one would think should have its compensations somewhere, but it must be said that they are not apparent to the ordinary observer. Such a life undoubtedly has some enjoyment for the young, active and vigorous, but for the afflicted and the aged the case is very sad. At very many of the points visited we were implored for advice and for medicine by the sick. Many having chronic diseases which simple surgical treatment would cure, are compelled to live out a shortened existence, for no physician except by merest chance ever visits them. The Department of Indian Affairs has physicians who attend to the medical wants to those Indians that are under treaty, but throughout the whole valley of the Mackenzie river, from Great Slave lake to the sea, nearly a thousand miles, being outside of treaty limits, there is no physician to be had. Surely the people of this country would endorse any action that the government might take to induce a few medical men to reside in those far outlying districts and afford medical relief where it is so much required.

The watershed of the Mackenzie is computed to contain 451,400 square miles of territory. Within it are the Athabaska, the Peace and the Liard, all great rivers, besides the Mackenzie itself; also the Athabaska and Great Slave lakes, and many other smaller lakes and rivers. They afford a great system of inland navigation, with comparatively little obstruction. To decide on an outlet to the Atlantic for the products of this large territory will be a problem for the future. The distance between Fond du Lac at the east end of Lake Athabaska, and Fort Churchill on Hudson bay, is less than 500 miles, and if these points were connected by a railway an outlet would be afforded vastly shorter than that via the St. Lawrence, and to a district of country greater in area than the whole watershed of that stream from Montreal west, including the great lakes of that basin.

CONTINUATION OF ROUTE OF EXPLORATION.

Having rested two days at Rampart House, we started down stream at noon on August 4, and immediately crossed the 141st meridian and entered Alaska. We will now be under the flag of the United States for some distance. About 5 p.m., at a distance of some 27 miles, we passed the site of Old Rampart House, and about 10 miles further down saw a tent on the beach, which proved to belong to a party of the United States Geological Survey in charge of Mr. Kindle. We camped here over night and left next morning at 9 a.m., August 5. We soon left the Upper Ramparts, which we have had for 40 or 50 miles, and having a strong current with us, made about 40 miles, camping earlier than usual owing to rain.

The next morning, August 6, we left camp at 7 a.m. and soon entered the Lower Ramparts, which are very beautiful, but they only extend about 5 miles. After this the country becomes level, the banks are lower and the river widens considerably. The timber, principally spruce, improves, resembling for size that of the Peel river. This was a fine day, and we made about 60 miles, camping at 11 p.m.

On Tuesday, August 7, we left camp at 6 a.m. It was a windy day, which somewhat retarded our speed. The country becomes flat and the banks low as we approach the Yukon river, which we reached at 10 p.m.

Fort Yukon is situated on the right bank of the Yukon river, about 2 miles above the mouth of the Porcupine. It will have been noticed that our whole course from Athabaska river to the delta of the Mackenzie, as well as that on the Bell and Porcupine rivers, was with the current, but in these 2 miles on the Yukon we had to work our boat against the stream, and this afforded a good idea of the difference in going up and down these rivers. It took us fully an hour and a half of very hard pulling and some tracking to make this distance.

I reached Fort Yukon about midnight, just two weeks after leaving Fort McPherson, and glad that we had again reached a point where steam navigation will make the journey homeward less arduous.

A further reference to the Ramparts of the Porcupine may be permissible. They are very picturesque, often rising perpendicularly or nearly so to heights varying from 40 to 200 feet. Frequently they appear like great stone fortifications. The river often narrows to from 500 to 800 feet, in some cases much less; and with frequent abrupt changes in the direction of the river, they appear, when looking ahead, to completely block the stream, and with the sunlight glistening on the rocks they resemble when seen from a distance, buildings of all sizes and shapes. Very frequently these are so grouped as to give the appearance of stone cities, similar to those seen in eastern lands.

The Upper Ramparts begin about 10 or 12 miles above the Alaska boundary, and extend down stream some 40 or 50 miles. The rock formation as we descend is for the first 25 miles a hard sandstone and quartzite; then changes to basalt for some distance, and below this limestone and shale penetrate upwards through the basalt.

The Lower Ramparts begin some 20 or 25 miles below the end of the Upper Ramparts. Their formation is principally magnesian limestone and shales, the limestone being the predominant rock.

The formation between the Upper and Lower Ramparts is clay, sand and gravel.

FROM FORT YUKON TO DAWSON CITY, ABOUT 385 MILES.

At Fort Yukon I had to wait from Tuesday night till the following Sunday evening for a steamer going up the river to Dawson. It was a 'deserted village' at that time, most of the Indians, who at certain seasons of the year inhabit the small log huts of a primitive style of architecture, being away. Before the Alaska boundary was defined the Hudson's Bay Company occupied Fort Yukon as one of their posts. There are now two white traders there, who do considerable business at certain seasons of the year.

I had been so rushed along for the past month that I had little time to reflect on anything but what was passing before my eyes. Within the last four short weeks I had travelled 1,300 miles down the Mackenzie, 82 across the mountains, and something in the neighbourhood of 450 at least in a canoe and row boat down the Bell and Porcupine rivers to this point. I have already stated that Fort Yukon is a few miles north of the Arctic circle. Its longitude is also a little over 145° west of Greenwich, and the local time here is about 4½ hours slower than in Ottawa. Perhaps many who are tolerably familiar with the geography of Canada would be surprised to learn that even Fort McPherson is much further west than any part of Vancouver island, while Fort Yukon is 10° further west still. In our journey north we changed time twice, and when I reached Fort McPherson the local time was one hour slower than that used in any other part of Canada. The reason is apparent. Our general course had been west of north, and as we ascend towards the pole, the convergence of the meridians so increases that a degree of longitude is soon passed over.

The Yukon river, for some 75 miles below Fort Yukon, and nearly as far above, is many miles in width, forming what is known as the Yukon flats. This portion of the river is filled with islands, and it would be unwise for anyone unacquainted with the proper courses to attempt to go up it without a guide, as he would be almost certain to get into wrong channels. Evidently these flats have once formed a large inland lake.

Fort Yukon is just a few miles beyond the Arctic circle, and notwithstanding this, I saw in a garden there at the time of my visit vegetables well advanced, peas fit for use, potatoes, lettuce, beans, beets, &c.

The Yukon is a swift flowing stream, the current probably averaging, between Fort Yukon and Dawson, 4 miles an hour. The distance is, I believe, 385 miles, but the machinery of our steamer, the *Lavelle Young,* was partially disabled, and it took us from Sunday evening till Friday afternoon, August 17, before we reached Dawson.

We crossed the international boundary on August 17, and again entered Canadian territory, which I had left at Rampart House twelve days before. At 5 p.m. we arrived at Dawson City, the most important town on the river or in this part of the continent.

I was five days at Dawson waiting for a boat to Whitehorse. During this time I had an opportunity of visiting the mines in the vicinity. It is beyond my field to make any report on the present condition of mining there. This will be competently done by members of the Geological Survey who have spent the past summer in that district. I may say, however, that the work seems now to be in a transition stage. The day for the hand miner with his rocker is over, and hydraulic mining and dredging (more particularly the latter) are being profitably engaged in.

What struck me very forcibly was the way in which the timber had been completely stripped from the hills, the larger for building purposes, for mining props and for fuel, and the brush for building embankments to hold the tailings. Spruce wood was selling for $13 per cord at the time of my visit.

DAWSON CITY TO SKAGWAY, 571 MILES.

The journey from Dawson City to Whitehorse, some 460 miles, was comfortably made in a well-equipped steamer, the *Dawson*. She left on Wednesday evening, August 22, and arrived at Whitehorse on Sunday afternoon, August 26, and on the following morning at 9.30 we took the train for Skagway, arriving there at 4.30 p.m.,

This road, which is 111 miles in length, is narrow gauge, but the road-bed is good and the cars comfortable. Along the route as far as the south end of Lake Bennett there is nothing specially worthy of note. The soil is generally sandy. Jackpine and spruce of little value for lumber are seen along the track. After leaving Bennett, the road winds up the mountain to the summit of the pass, which is 2,897 feet above the sea. Here we pass again into United States territory. The road descends 21 miles with a very steep grade to Skagway, at tidewater on an arm of the Lynn canal. The trip between Bennett and Skagway affords some exceedingly fine mountain scenery. In many places we pass near the snow line, and from Skagway a large glacier is visible. The country is almost entirely devoid of timber. The rocks are granite, and in no part have I seen a more desolate landscape.

FROM SKAGWAY TO VANCOUVER, 867 MILES.

The fine Canadian Pacific Railway steamer *Princess May* was waiting at the dock at Skagway when we arrived, and at 8 p.m. on Monday, August 27, we started for Vancouver. I was sorry that the trip down the Lynn canal was made at night, and a very dark one at that, which prevented our having a view of the glaciers that otherwise would have been visible. Tuesday was a dull, rainy day and without anything of interest to record. The steamer called at Port Simpson early on Wednesday morning, and passed Kaien island, the site of the future city of Prince Rupert, in the forenoon, but did not stop. A little later we called at Port Essington, but the tide was out and our steamer was unable to reach the dock. Further on we called at Caxton, where there is a very large cannery and where we took on a quantity of canned salmon. On Thursday at 6 a.m. we called at Bella Bella, and at 3 p.m. at Alert bay on Vancouver island, to see the totem poles of the Indian village there. Nearly the whole sail from Skagway is so sheltered with islands that one can fancy he is sailing down a river.

On waking on Friday morning, August 31, I found we were approaching the City of Vancouver. It was a delightful morning, and at 7.30 our steamer tied up at the wharf, and my round trip may be said to end here. The distance travelled from Edmonton to Vancouver was about 4,250 miles, and occupied a few days less than three months. It has been to me a trip of very great interest, and I trust the little information gained, and which I have endeavoured to convey in this report, may be of some public service.

I have the honour to be, sir,
Your obedient servant,
E. STEWART,
Superintendent of Forestry.

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